

JANIS 40
CHAPTER VI

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EUROPEAN
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JOINT ARMY NAVY
INTELLIGENCE STUDY

EUROPEAN
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PORTS, SHIPPING AND NAVY

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Chapter VI

PORTS, SHIPPING, AND NAVY

Prepared under supervision of Office of Naval Intelligence, by Board of Engineers for Rivers and Harbors, Corps of Engineers; and by the Eastern European Desk, Office of Naval Intelligence

60. INTRODUCTION

In this chapter the principal and secondary ports are discussed by coasts: North Coast, Topics 61 and 62; West Coast, Topics 63 and 64; and South Coast, Topics 65 and 66. The minor ports and landings of all three coasts are briefly summarized in Topic 67. Astrakhan', the only European USSR (JANIS 40) port of any importance on the Caspian Sea, is discussed in detail along with ports of the Caucasus Area in JANIS 41, Chapter VI, 64, C.

The available data on naval establishments at the ports are included as an integral part of the descriptions. Data on the personnel, organization, and vessels of the Navy and Merchant Marine are not included in this chapter in view of the scheduled early publication of more recent and comprehensive basic intelligence on these topics.

Anchorage related to the principal and secondary ports are summarized in TABLE VI-1, and are more fully discussed under the individual port. Anchorages for minor ports and landings are briefly listed in TABLE VI-74, and those related to beaches are discussed in Chapter IV.

A. Ports

(1) General characteristics

(a) *Areal distribution.*—The greatest concentration of important ports of European USSR is in the Gulf of Finland—Baltic Sea area. There are nine principal ports in this west coast region as compared to two on the north coast, and five on the south coast on the Black Sea and Sea of Azov. Secondary ports are about equal in number, but those on the west and south coasts are considerably more important to the commercial economy of the USSR. The south coast has about one-half as many minor ports and landings as are on the west and north coasts. Those on the south and west coasts are more important to the economy of the country than the more isolated coves and inlets on the north coast.

A location map (FIGURE VI-174) of all ports and landings is at the end of the chapter; a location map of ports on each coast is placed at the beginning of the discussion of the first principal port of each coast (FIGURES VI-1, VI-41, and VI-127).

Principal and secondary ports are summarized in TABLE VI-1, minor ports and landings in TABLE VI-74.

The places discussed in this chapter are classified and distributed as follows:

NORTH COAST WEST COAST SOUTH COAST

PRINCIPAL PORTS

<i>Topic 61:</i>	<i>Topic 63:</i>	<i>Topic 65:</i>
Arkhangel'sk	Leningrad	Odessa
Murmansk	Kronshadt	Kherson
	Tallinn, Estonia	Sevastopol'
	Riga, Latvia	Mariupol'
	Ventspils, Latvia	Rostov
	Liepāja, Latvia	
	Klaipėda, Lithuania	
	Kaliningrad	
	Baltiysk	

SECONDARY PORTS

<i>Topic 62:</i>	<i>Topic 64:</i>	<i>Topic 66:</i>
Molotovsk	Oranienbaum	Nikolayev
Onega	Vyborg	Yalta
Belomorsk	Uuras	Feodosiya
Kem'	Makslakhden	Kerch'
	Satama	
Kandalaksha	Koyvisto	Osipenko
Iokan'ga	Paldiski, Estonia	Taganrog
Polyarnyy	Pärnu, Estonia	
Vayenga		

MINOR PORTS AND LANDINGS, Topic 67:

Amderma	Vilayoki	Ochakov
Khabarovo	Repola	Skadovsk
Guba Varneka	Lis'yenosskaya	Khorly
Guba Belush'ya	Gavan'	Yevpatoriya
Nar'yan-Mar	Ust'ye	Balaklava
Unskaya Guba	Luzhsкая Guba	Mys Kilik-Atlama
Solovetskiy	Narva, Estonia	Genichesk
Guba Pon'gama	Kunda, Estonia	Azov
Keret'	Loksa, Estonia	
Guba Kovda	Haapsalu, Estonia	
Guba Bol'shaya	Rohuküla, Estonia	
Por'ya	Virtsu, Estonia	
Gavrilovo	Ainaži, Latvia	
Teriberka	Pāvilosta, Latvia	
Port-Vladimir	Sventoji, Lithuania	
Bukhta Ozerko		

Note: Many of the west coast ports are in Estonia, Latvia, and Lithuania, which have been incorporated into the USSR. Those acts are unrecognized by the United States Government. The native orthography of these countries, instead of the Russian spelling, has been used in this chapter for the names of places and natural features. Russian spellings have been used for former East Prussia and Finland territories now in the USSR. Generally the more commonly known place names and functional names of port installations have been retained in English.

(b) *Pertinent characteristics*

1. **NORTH COAST.**—Navigation at the ports on the north coast is hindered by ice in the winter season, and some are closed to navigation for seven months of each year. Murmansk is normally kept open by ice breakers, but Arkhangel'sk is usually icebound from November to mid-May. To meet a war exigency, however, the wharf facilities at Bakaritsa in the Arkhangel'sk port area, two miles above Arkhangel'sk and about 28 miles from the gulf, were kept open to navigation with ice breakers during the winter of 1943-1944.

The ports along the north coast are variously affected by tide, and the amount of rise lessens from west to east. The high water springs at Iokan'ga is 18¾ feet, but only 3 feet at the city of Arkhangel'sk. Water levels of ports at mouths of rivers are considerably affected by spring floods, and wind affects all of the ports.

Arkhangel'sk port is spread along the river channels for about 25 miles on the mainland and the islands of the delta. The city is about 26 miles from the bar which has a high water depth over it of about 23½ feet. The channels inside the bar are deeper, but continual dredging is necessary to maintain the depths. Liberty type ships discharged heavy tanks at Bakaritsa during the war.

Arkhangel'sk is primarily an export point for timber and timber products. In 1937 more than 2 million short tons of cargo, mostly lumber, was exported. Imports are small.

The headquarters and main operating and repair base of the White Sea Flotilla, and the rear base of the Northern Fleet are located at Arkhangel'sk. A few miles to the west is Molotovsk, a new port which is planned to be the largest shipbuilding location in the USSR. While it is not a naval base, it will build warships, including capital ships.

A single-track railroad runs from Molotovsk through Arkhangel'sk, on the left bank of the river and opposite the city, to Vologda and thence to Moscow. Some distance south of Arkhangel'sk the line is double track. A connecting line from Obozerskaya is laid to the northwest to Belomorsk for junction with the line from Leningrad to Murmansk.

Murmansk is on the eastern shore of Kol'skiy Zaliv, about 30 miles from the mouth. The roadstead will accommodate any size of vessel and the port is well sheltered. About two-thirds of the city and a considerable part of the port facilities were either damaged or destroyed during the war, which interrupted the proposed development of this port to the chief shipping point of the north. Cargo turnover in 1936 amounted to about 1,360,000 tons, of which exports were about 700,000 short tons and imports were about 104,000 short tons. The planned, but unattained cargo to be handled in 1942 was 5,755,000 tons.

The largest naval base area of the Arctic is in Kol'skiy Zaliv (Kola Inlet). The administrative headquarters of the Northern Fleet "Service of the Rear" are at Murmansk, and its depots are located at several smaller bases along the shores of the inlet, such as Rosta, Vayenga, and Drovyanoye. Polyarnyy is an all-naval base and is the headquarters of the Commander-in-Chief of the Northern Fleet. Vayenga Naval Base is about 14 miles northeast of Murmansk and is the chief operating base of the Northern Fleet. Guba Vayenga is used by the Northern Fleet as anchorage, and on the northern side a pier for capital ships is being constructed. Naval repair facilities are at several places in Kol'skiy Zaliv. Bases for submarines and minor combat vessels are located at several small bays in the inlet.

Iokan'ga has been developed into an advance base for antisubmarine action.

Kandalaksha has some quayage for deep-draft vessels. Belomorsk is the northern end of the Stalin White Sea-Baltic Canal which shortened the sea route from the Gulf of Finland to the White Sea from 2,200 miles to about 500 miles. During the war, *Engels*-class destroyers used the canal. This route makes it possible to move vessels from the west coast to the Pacific via the Northern Route for about two months of each year, without passage in the Atlantic or North Sea.

Vayenga, Polyarnyy, Murmansk, Kandalaksha, Kem', Belomorsk, and Onega are on either the main or branch line of the railroad to Leningrad. A few of the minor ports and landings also are on a railroad line. Generally the vehicle roads are poor in the north coast area.

2. **WEST COAST.**—The ports along the west coast are hindered in winter by ice of various thickness and duration. The formation and disappearance dates vary from year to year in accord with the severity of the season. The channels of the more important places, however, are either kept open or the navigation season is extended by the use of ice breakers. Information on ice conditions is included in the descriptions of the ports.

The water level is non-tidal, being affected primarily by winds, atmospheric pressure, and seasonal variations in the amount of water brought down by the rivers. Various combinations of these three result in different levels as much as 3 feet above or 3 feet below mean level. The extreme range of level observed is 13'3".

The west coast ports of greatest importance are Leningrad and Tallinn on the Gulf of Finland, and Riga and Kaliningrad on the Baltic Sea. Although of little significance as a commercial port, Kronshtadt is an important naval base. These more important ports as well as most of the other west coast ports are natural shallow harbors and rivers artificially developed for deeper-draft shipping. Dredging is required in practically all of the ports to maintain the channel and harbor depths.

Before the war Leningrad was the main foreign commercial port of the USSR and handled more tons of dry cargo than any other port. The port water area was about 12,000 acres, and linear feet of quayage was about 8 miles. During the war the port and city were extensively damaged. Prior to the war Leningrad was the shipbuilding center of the Soviet Union, and its facilities were adequate for repairs of any nature. Two of the yards could build battleships.

Tallinn, Estonia, has two harbors and several shipyards with a total quayage of about 20,000 linear feet. Tallinn was the base of the Estonian Fleet, and it was used by both Germany and the USSR. Present use is unknown.

Riga, Ventspils, and Liepāja are the most important ports of Latvia. Riga, about equal to the combined size of the other two, has about 6 miles of quayage spread along 10 miles of river front and has 13 miles of boat and shallow river craft quayage farther upstream. Riga had no naval significance, but Ventspils was a base for motor torpedo boats in 1940. Liepāja has been a naval base since Tsarist days and was designed as an advance base of the Baltic Fleet, probably next to Tallinn in importance. All three had repair yards, and Liepāja had two 600-foot-long graving docks.

Klaipėda, Lithuania, has about 1 mile of quayage with alongside depths exceeding 20 feet. It was used by the Germans as a U-boat and destroyer base, but its use by the Soviet Union is unknown. According to a USSR radio broadcast in 1946, the port is to be developed to an annual cargo capacity of 4,200,000 tons.

NAME AND LOCATION		ANCHORAGE	ENTRANCE	HARBOR
WEST COAST, SECONDARY PORTS (Continued):				
Paldiski, Estonia	59°21'N, 24°03'E	In Paldiski Laht in 6 to 16 fms. The best protected anchorage is SW of the old harbor in 8 to 9 fms. over mud.	Harbor opens directly into Paldiski Laht with depths ranging from 5½ to 22 fms.	The bay P. the island mainland old harbor
Pärnu, Estonia	58°23'N, 24°29'E	An area of Pärnu Laht about 5 miles long and 2½ miles wide.	Across the bar, 58 to 116 yards wide and 18' to 20' deep.	Lower section Sauga (winter harbor) 15' deep
SOUTH COAST, PRINCIPAL PORTS:				
Odessa	46°30'N, 30°45'E	Extensive in bay off the port in 30' to 40' over soft mud and shells. In the harbor road, inside the breakwaters, is protected anchorage in 28' to 32'.	The E. and most-used entrance is 350' wide, 31' to 33' deep. N entrance is as wide but 30' deep.	About 700' harbor with
Kherson	46°37'N, 32°37'E	Vessels moor to buoys in roadstead outside channel.	Dredged channel from Black Sea had a 1940 depth of 23 feet. Channel through bay had a bottom width of 350'. The Rvach entrance to the Dnepr is used by seagoing vessels.	Roadstead about 1,400' depth
Sevastopol'	44°37'N, 33°32'E	For vessels of deepest draft and large enough for the Black Sea Fleet.	Entrance to main harbor is about 2,000' wide between 5-fm. contours; midchannel depths are 10 fms. deep. Channels to small harbors are well marked.	Considered Black Sea long and midchannel 10 fms. harbors
Mariupol'	47°05'N, 37°34'E	Several areas in 15' to 25.5' of water.	About 8½ miles long, 24' deep in 1941, with a bottom width of 328 feet.	More than water areas.
Rostov	47°13'N, 39°42'E	Unlimited in roadstead, Bol'shoy Taganrogskiy Reyd. Vessels prohibited anchorage in reaches of river, canals, or dredged channels.	Approach channel is 250' wide and 12' deep. Except for the last 7 miles below Rostov, river channel is extremely sinuous.	A 3¼ mile with 13' stream.
SOUTH COAST, SECONDARY PORTS:				
Nikolayev	46°57'N, 31°59'E	Prohibited in harbor; vessels berth at wharves or moor to buoys close off the wharves.	A 43-mile-long, 150-foot-wide, 28-foot-deep channel from Black Sea, through Dneprovskiy Liman, thence up the Yuzhnyy Bug.	Mole-protected harbor 1,000 acres with The fort same size deep but
Yalta	44°30'N, 34°10'E	About ½ mile S of town and harbor in roadstead in 10 to 13 fms. over mud and sand. An appreciable current and a swell when winds are southerly.	Entrance from south has 33' to 35' depths in fairway.	About 35 ranging part and part. Re these channels ably shore
Feodosiya	45°02'N, 35°24'E	In bay off the port in 5 to 12 fms. over soft mud. Sheltered from all but easterly winds.	Between breakwater and mole about 980' wide and had a depth of about 30'.	Mole-protected harbor 1,000 acres with about 30
Kerch'	45°21'N, 36°29'E	Roadstead in W part of Kerchenskaya Bukhta for vessels drawing 12' to 13'. Vessels of deeper draft anchor in Yuzhnyy Peregruzochnyy Reyd.	About 3 miles long, 260' wide, and 19' deep in 1941. In 1938 it was 20.5'. Branch channels to Petroleum Pier and metallurgical works are about 15' deep.	About 140' 22' deep bottom.
Osipenko	46°45'N, 36°47'E	Extensive in Berdyanskiy Reyd in 18' over soft mud.	A 7½-mile-long channel from entrance to Berdyanskiy Zaliv to protecting breakwater is 300' wide at bottom and maintained at 22' deep.	A 25-acre behind parallel shore.
Taganrog	47°12'N, 38°57'E	Extensive in Bol'shoy Taganrogskiy Reyd in 18' to 23' over good holding ground.	Dredged channel, 5¼ miles long, 180' wide at bottom, with least depth of 13' in 1938.	Three mo formed later area depths (

TABLE VI - 1 (Continued)

PORT OR WATER AREA	LINEAR FEET OF WHARFAGE IN VARIOUS DEPTHS						RANGE OF WATER LEVEL	ICE CONDITIONS	
aldiski Laht, between Väike-Pakri and the new harbor. The protected area is small.	...	1,855	775	...	...	2,630	No data available.	Interferes with navigation at times during the winter.	F
ions of the Pärnu and rivers) and a small harbor generally 12' to in lower part.	...	...	3,120	...	...	3,120	Extreme recorded changes are 6' above and 3' below mean level, caused by winds.	Severely cold in winter with navigation blocked by ice from late December to early April.	N
acres of enclosed harbor 13' to 33' depths.	9,490	5,430	4,435	1,100	...	20,455	Nontidal. Maximum rise 2'7" and maximum fall is 4'0". Seasonal variation of Black Sea and outflow of rivers.	From 2" to 4" thick from December to March; 10" in 1937. Usually kept open.	T
in the Dnepr has 700 acres with 30' to is off the town.	...	...	4,120	...	...	4,120	Nontidal. Canalization above keeps level fairly constant except during spring floods when maximum rise may reach 8.5'.	Average 12" to 14" but may reach 27" in severe winters. Usually kept open.	S
best and safest in area. About 4 miles 1 3/4 mile wide with depths from 8 to Numerous coves and open from bay.	740	3,300	7,785	4,730	...	16,555	Nontidal, but regular fluctuations have a mean range of 28".	Never frozen over.	S
250 acres of sheltered area in the two port	...	11,265	3,720	800	...	15,785	Nontidal, but there is a regular seasonal variation. Other variations caused by wind with a mean range of 6'.	Ice averages 105 days each year and 30" thick. Easterly winds, if continuous, may pack the ice to 10' thickness.	I
stretch of the Don to 22' depths in mid-	...	...	...	12,940	...	12,940	Nontidal. River level subject to considerable fluctuation. Level may be lowered by as much as 9' and raised by as much as 10'.	Ice from 1' to 1 1/2' thick generally closes river between early December and late March.	I
ected coastwise trade an area of about 40 th 12' to 23' depths. sign port, about the e, is from 25' to 30' mostly 28'.	...	1,075	...	...	9,240	10,315	Nontidal. The variations are 2.6' above or below mean water level, with fresh winds raising or lowering the level occasionally by as much as 3'.	River frozen about 92 days each year from mid-December to mid-March with ice about 20" thick. Ice breakers keep port open.	I
acres, mole-protected, from 27' to 33' in SE 9' to 10' in N and NW recent reports indicate arted depths considered.	135	300	1,590	460	...	2,485	Nontidal. Range is about 2' with maximum rise of 1'2" and fall of 10".	Ice-free.	I
ected basin of about 64 h depths of 24', except acres of 19'.	340	3,790	600	...	...	4,730	Nontidal. Range of 2' above and below the established datum of 5.25" above average minimum recorded.	Open to navigation the year around. Ice breakers rarely required.	I
acres, 14' deep in S and in N. Soft mud bot-	...	...	4,360	1,940	...	6,300	No lunar tides. A difference of 3' has been observed.	Icebound for about 40 days during January and February.	I
mole-protected basin a 2,100' breakwater to and 1/2 mile off the	...	...	2,985	...	...	2,985	No lunar tides. Maximum fall about 1.5' and rise about 3' from mean sea level.	Ice forms from mid-December to late March. Open period of navigation is about 296 days.	I
le- and breakwater- asins have a total wa- of about 69 acres with 1938) of 13' and 14'.	3,355	3,620	...	6,975	Nontidal. Range due to winds is about 8.5'.	Ice closes port from mid-December to March and may attain 23' thickness.	I

PRINCIPAL AND SECONDARY PORTS

JANIS 40

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INLAND CLEARANCE	YEAR AND MAXIMUM KNOWN VOLUME OF TRADE THROUGH PORT	NAVAL ESTABLISHMENTS	BUILDING OR REPAIR FACILITY
ail and highway connections.	1936	14,421 No data.	No data.
arrow-gage lines lead from Pärnu to several points on 5'0"-gage line. Low-grade highways extend to Tallinn and Riga.	No data.	An aerial photo indicates mine-sweepers and gunboats were based here.	Engine repairs in government shops and other vessel repairs in privately owned yards.
hree R.R. lines lead from Odesa. New road leads along coast to E. Other roads lead northward.	1935	841,040 Not a naval establishment.	All shipyards were destroyed by the Germans but minor repairs were obtainable in 1944. The Marti yards built small war-ships.
ingle-track R.R. and several roads lead inland and along coast.	1935	266,806 No exclusively naval establishment but Comintern yards built motor torpedo boats and gunboats.	Several yards building and repairing commercial and naval vessels. The only floating dry-dock building yards in USSR are reported located here.
ingle-track line through Simferopol'. Highways connect into the Crimean Peninsula net.	1935	312 Prior to capture by the Germans, the port was the main base of the Black Sea Fleet and the headquarters of its Commander-in-Chief. Except for a small portion, the port was for naval use.	Several building and repair yards. Ships of all sizes up to destroyers were built here. The Navy Yard was primarily a maintenance yard. A dock on the north side would receive capital ships up to 30,000 tons.
ouble-track line connects into USSR net. Low-type (dirt) roads lead inland and along the coast.	1935 (In 1932 about 1,775,800 short tons of coal was shipped.)	1,495,233 No data.	Present status of the two marine repair plants is unknown. The one in Zintsev Harbor could accomplish all commercial repairs required by the merchant fleet in the Sea of Azov.
ouble-track lines to N and S provide Rostov with the best rail connections of any Black Sea port. Roads are reported to be poor.	No data.	No data.	Two small yards for river craft.
ail connections with USSR network and roads lead to Kherston, Odessa, and Kirovograd.	1935	1,163,106 No port area for exclusive naval use. There are some naval barracks, a naval aviation school, model-testing basin, and Admiralty offices.	The chief naval shipbuilding yards of the Black Sea area and the only one in the area capable of building capital ships. Two other yards built and repaired naval and commercial vessels.
o R.R. clearance. Highways lead inland and along coast.	No data.	None.	Small-craft repairs only.
ail line to USSR network. Roads lead inland and along coast.	1935	561,034 No data available on any naval establishment.	Small port-owned shops for repairs to moderate-sized vessels.
ail line to USSR network. Two seasonal low-type roads lead to W.	1936	23,875 None.	About 7 miles S of the harbor is a small yard for repair of commercial vessels and building of small craft.
ail line connects into USSR network. Three third-rate roads lead from town.	1934	126,800 None.	Small-craft repairs.
ail connections with two double-track lines. All-weather roads lead along coast but lower type roads lead to N.	No data.	None.	A small yard for small-craft and above-water repairs to larger vessels. A larger yard reported under construction.

NAME AND LOCATION		ANCHORAGE	ENTRANCE	HAI
NORTH COAST, PRINCIPAL PORTS:				
Arkhangel'sk	64°28'N, 40°32'E	Off city in roadstead 30' to 68'. Numerous in approaches to city. Temporary in bay outside the bar.	A 350' fairway, 23.5' at H. W., crosses the bar. The channels inside are upward from 600' wide and generally 24' deep; 26 miles to the city.	Extensi tribut depth
Murmansk	68°58'N, 33°03'E	Kol'skiy Zaliv for vessels of any size, 100 vessels simultaneously anchored in 1944. Good in harbor area off Rosta.	Through Kol'skiy Zaliv about 26 miles, 2 miles wide, 100 fms. deep.	About 3 wide, 20 fm
NORTH COAST, SECONDARY PORTS:				
Molotovsk	64°35'N, 39°47'E	Protected for about 5 vessels in 30' over good holding ground.	Dredged channel, 5 miles long, 180' wide, 27' to 30' deep. Constant dredging required.	About 2
Onega	63°55'N, 38°04'E	Seaward from river mouth. Usual is 2 miles E of Shogly Ostrova in 21' to 23'. Depths of 12' to 36' between mainland and island.	Karel'skiy Farvater maintained by dredging, 14.5' at low water neaps (1937).	About 7 abreas
Belomorsk	64°32'N, 34°48'E	Extensive roadstead exposed to NE winds, 20' to 36'. Small craft only in harbor.	Dredged channel 2 miles long, 300' wide, 15.5' deep (1936) leads to head of harbor.	Irregular and deep inside
Kem' (Port is Rabocheostrovsk,	64°57'N, 34°37'E 64°59'N, 34°47'E)	Outside, just N of Ostrov Yak, and off the port.	Between Ostrov Yak and Ostrov Rabocheostrovsk, less than 600' wide in places, least charted depth of 24'.	About 1 2,600'
Kandalaksha	67°08'N, 32°25'E	Off the town in 15 to 38 fms. Small vessels between 6- and 10-fm. contours, 1,200' offshore.	Fairway close to NE shore has a clear width from 1.2 to 4 miles and depths from 5 to 38 fms.	3.5 miles 7 to 3
Iokan'ga Naval Base	68°04'N, 39°30'E	A mile-long section of roadstead west of Ostrov Vitte in 6 to 12 fms. over mud and sand. More exposed off Ostrov Sal'nyy in 10 to 16 fms.	Main entrance between Ostrov Sal'nyy and Ostrov Medvezhiy, about ½ mile wide between 10-fm. contours.	About 4 yards in cer
Vayenga Naval Base	69°05'N, 33°27'E	In 18 fms. with Mys Karbas bearing 352° and Mys Alysh, 249°. Six 1st-class anchorages, of which 3 are at mooring buoys.	Free and clear with depths of 18 to 38 fms.	A mile-1 with s are 18 but or
Polyarnyy Naval Base	69°12'N, 33°28'E	SE of harbor, off naval base in 20 to 24 fms., poor holding ground.	N entrance 1,000' wide, 30 to 40 fms. deep.	About 1 2,000'
WEST COAST, PRINCIPAL PORTS:				
Leningrad	59°56'N, 30°18'E	No free-swinging berths in port. About 44 ships can be moored to buoys in depths of 22' to 28'. Near Kronshtadt in Nevskaya Guba third-class berths are available but exposed to strong easterly winds.	A dredged channel, 13.5 miles long through Nevskaya Guba from Kronshtadt to Lower Harbor of Leningrad had a minimum bottom width of 350' and a dredged depth of 31' (1928) in the open section. The protected section was 280' wide. It was reported in 1945 that limiting draft was 23' for vessels entering the harbor.	The po lower about with in der Ship al) ex throug Neva deep
Kronshtadt	59°59'N, 29°46'E	In Malyy Reyd opposite Central Harbor in 28' over mud, exposed to southeasterly winds. Fair-weather anchorage in Bol'shoy Reyd in 13 to 16 fms. A few mooring buoys in harbor.	Several entrances through protecting mole but south channel (Yuzhnyy Kronstadtskiy Farvater) is the only one permitted merchant vessels. It has a 30-foot project depth and leads about 6.5 miles through Bol'shoy Reyd.	About 3 and s of the Harbo lieved other 17' tc canals

TABLE VI - 1

SUMMARY OF PRINCIPAL AND SECONDARY PORTS, EUROPEAN USSR

HARBOR WATER AREA	LINEAR FEET OF WHARFAGE IN VARIOUS DEPTHS						RANGE OF WATER LEVEL	ICE CONDITIONS
	25'+	20'-25'	12'-20'	0'-12'	Unknown	Total		
... in several channel dis- tributions; various widths and depths.	6,100	39,635	9,290	2,580	...	57,605	At bar: H.W. springs 3.6', neaps 3.0'. At city: H.W. springs 3.0', neaps 2.5'. MSL at city 1.9'.	Normally closed Decem- ber to May. Bakaritsa kept open winter of 1943-1944.
... miles long, 1/2 to 1 mile wide; mid-channel depths 10 to 15 fms. deep.	1,000	10,960	4,375	1,245	740	18,320	Mean H.W. springs 12.0', neaps 9.75'.	Virtually ice-free, break required occasionally.
... 50 acres, 28' to 30' deep.	2,240	...	...	...	1,600	3,840	Mean H.W. springs 3.0', neaps 2.5'; mean water level 1.5'.	Similar to Arkhangelsk.
... 1/4 mile wide, 19' deep at town.	...	...	1,000	2,390	200	3,590	Mean H.W. springs 5.5', neaps 4.5'; mean water level 2.75'.	Closed from early Novem- ber to mid-May.
... r, shallow with shoals and rocks. From 25' to 30' at entrance to 15' to 20'	...	1,450	1,450+	...	...	2,900+	Mean H.W. springs 4.75', neaps 4.0'; mean water level 2.5'.	Closed from mid-October to May.
... .5 miles long, 1,000' to wide, 18' to 26' deep.	1,390	...	2,690	...	1,270	5,350	Mean H.W. springs 6.0', neaps 5.0'; mean water level 3.5'.	Closed from early Decem- ber to mid-May.
... s long, 1/2 to 1 mile wide, 8 fms. deep.	...	...	820	100	...	920	H.W. springs 7.25', neaps 6.0'.	Closed from early Novem- ber to end of May.
... miles long, 500 to 2,200 wide, 10 to 18 fms. deep at central part.	750	...	750	...	...	1,500	H.W. springs 18.75', neaps 15.25'; mean water level 11.0'.	Ice up to 6" thick in some places. Never closed to navigation.
... long indentation of coast with shoaled margins. Depths from 3 to 38 fms. at entrance about 3 fms. at head.	...	...	2,190	...	380+	2,570	Mean H.W. springs 12.0', neaps 9.75'; mean level 7.0'.	Only shallow waters free from strong winds break up including wintering in harbor.
... .5 miles long by 1,000' to wide, 6 to 24 fms. deep.	470	2,570	...	1,090	...	4,130	Mean H.W. springs 12.0', neaps 9.75'; mean level 7.0'.	Usually free until February may form but insufficient to interfere with navigation.
... rt (Morskoy Kanal and part of the Neva) has 12,000 acres of water about 8 miles of quayage depths from 18' to 28'. The Channel (Morskoy Kanal) extends for about 2 miles from Lower Harbor to the head and is about 31' to 32' wide and 135 yards wide.	13,910	15,780	3,070	4,050	2,100	38,910	Nontidal average range is from 3.0' above to 1.5' below mean water level. Maximum rise 7.0' above; greatest fall, 3.0' be- low mean level.	Closed to navigation for a few weeks, 22 January to 5 March. Number of ice breakers the navigation season. Average thickness of ice is never more than 3.3'.
... 100 acres in four harbors smaller basin. Depths of 47-acre Coastal Trade Harbor are not known but be- lieved to be more than 13'. The three harbors are from 18' to 28'. Several miles of quayage provide lighter quayage.	6,315	1,800	8,955	5,600	2,640	25,310	Lunar tides are negligible. Range caused by winds is from 3' above to 2' below mean level.	Normally icebound from November to April. Ice be- hind navigation, but winters vessel move- ment are not possible from January through March.

TABLE VI - 1
 PRINCIPAL AND SECONDARY PORTS
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	INLAND CLEARANCE	YEAR AND MAXIMUM KNOWN VOLUME OF TRADE THROUGH PORT		NAVAL ESTABLISHMENTS	BUILDING OR REPAIR FACILITY
		Short tons			
ber to open	R.R. to Vologda and net from station on left bank; spur to Molotovsk. Poor local roads.	1936 (Mostly export; includes minor imports through Molotovsk.)	2,222,121	Main operating and repair base for White Sea Flotilla, rear base of Northern Fleet.	Naval and commercial yards.
rs re-	R.R. to Leningrad; spur connection with Polyarnyy. Roads are poor.	1937	951,613	Principal Arctic naval base. The Northern Fleet "Service of the Rear" administrative headquarters is at Murmansk with operations facilities at contiguous Rosta.	Commercial and the major repair base for Northern Fleet.
	R.R. to Arkhangel'sk. Poor plank roads in immediate area; no highway inland.	No exports; small imports included in Arkhangel'sk total.		New port. Not a naval base but will do building and repair to include battleships.	Proposed development to largest building yards in USSR.
ber to	On branch of Murmansk - Leningrad R.R. between Belomorsk and Obozerskaya on Arkhangel'sk - Vologda line.	1935	289,865	None.	None.
o mid-	On branch of Murmansk - Leningrad line from Belomorsk through Onega to Obozerskaya on Arkhangel'sk - Vologda line. N end of Stalin White Sea - Baltic Canal. Poor-grade road to Kem' and Kandalaksha.	1937	75,202	Minor naval activities.	Small machine repairs at saw-mill shops.
ber to	On Murmansk - Leningrad line. Road to Belomorsk and Kandalaksha.	1937	65,927	None.	For small craft only.
ber to	On Murmansk - Leningrad line; branch from a few miles S leads to Finland. Low-grade road follows branch and main line to Krem'.	No data, small volume.		None.	Minor repairs.
re win- naviga-	Poor local roads.	No commercial significance. Only small fishing village prior to World War II.		An advance base for anti-submarine and mine-sweeping operations.	Small shop facilities. Dry dock 500' long by 45' wide.
ze, but e, pre- rbor.	15-mile extension of Murmansk - Leningrad line reported. Local roads and to Murmansk.	No commercial significance.		Chief operating base of the Northern Fleet. Development continuing.	Some repair facilities for naval vessels. A 1,200-ton floating dry dock was largest available.
y. Ice ntly to n.	An extension of Murmansk - Leningrad line. Poor local roads.	No commercial significance.		Hq. of Commander-in-Chief of the Northern Fleet. Operating base for submarines and destroyers.	Machinery and above-water hull repairs. Repair ship moored here.
bout 15 lay. A extend Aver- 1.3' and	Rail and highway connections into USSR network.	1934 Imports Exports Total (About 33.1% of imports and 22.6% of exports through European USSR ports.)	374,054 4,320,986 4,695,040	Not a naval base but berths are available and used by naval vessels. Naval academy here.	Commercial and the chief naval shipbuilding yards of the Baltic Fleet are located here. Two yards can build battleships. Arming of ships is carried on here.
n No- reakers in se- ments anuary	None except local on the island. During winter when Nevskaya Guba is frozen vehicles cross the ice to Leningrad.	No data available; primarily naval supplies.		Chief naval operating base for the Baltic Fleet. Capital ships were berthed here. Various naval installations.	Considerable repair facilities including dry docks for battleships, but lack of large cranes limits scope of activities.

NAME AND LOCATION		ANCHORAGE	ENTRANCE	HAR
WEST COAST, PRINCIPAL PORTS (Continued).				
Tallinn, Estonia	59°26'N, 24°45'E	North of Old Harbor and in Teliskopli Laht in 6 to 18 fms. over mud. Small craft in 5 fms. or less near New Harbor.	Through Tallinna Laht (bight) and Reid (road) natural depths of 10 to 40 fms. Adjacent to Old Harbor and shipyards depths are 5.5' or more, and at least 4 fms. at New Harbor.	Two artificial basins, bays, 15' to 3
Riga, Latvia	56°57'N, 24°06'E	In roadstead 2 miles northwest of entrance moles in 10 to 11 fms. over mud, but unsafe during strong northerly winds. Some anchorage in river clear of navigation channel.	The bar of the Daugava extends more than 1 mile seaward from head of entrance moles. The least depth of dredged channel was 27' in 1939. Depth lessens to 20' at uppermost part of harbor.	Comprise tributary stream
Ventspils, Latvia	57°24'N, 21°32'E	In roadstead 2¾ to 4½ miles offshore in 8 to 10 fms. Several third-class anchorages in Outer Harbor.	Dredged channel 110 yards wide with controlling depth of 23', possibly 25'.	Outer Harbor with 11 miles of 2,000 y and al Upper from 2
Liepāja, Latvia	56°31'N, 21°00'E	Roadstead outside harbor is entirely unprotected, 5 to 7 fms.	A 600'-wide, 27'-deep channel leads from the open sea to the middle of three entrances to Outer Harbor. Entrance to Commercial Harbor is 500' wide and 24.5' deep. Entrance to Naval Harbor Canal is 300' wide and about 28' deep.	More than harbor to 32'. of 25 ships, destroyer
Klaipėda, Lithuania	55°43'N, 21°07'E	In roadstead in 10 to 13 fms., unsafe when winds are from south through west to north.	Normally 820' wide and 23' deep but reported in 1945 as suited for vessels drawing no more than 16'. Entrances to New Basin are 21.5' and 23' deep, 150' and 100' wide.	Comprise northern Haff, 6 (lower mena)
Kaliningrad	54°42'N, 20°29'E	Vessels can moor along the Pregel' channel, but no free-swinging anchorage is available.	Königsberg Ship Canal, about 20 miles long, least bottom width of 156', and a least depth of 26'.	Comprise two br excav
Baltiysk	54°38'N, 19°54'E	Open anchorage in 10 fms. in roadstead and mooring in entrance channel in about 30' over hard sand.	Seaward entrance to Outer Harbor is 360' wide and 30' deep. Connection from SE end of Outer Harbor with Königsberg Ship Canal is 450' wide and 28' deep. Approach channel is 1,200 yards long, 328 yards wide, with a least depth of 33'. Entrance for Frisches Haff is from 400 to 475 yards wide with a center least depth of 30'.	Outer Harbor to 30'. long, a Rear H to 21' about Several harbor
WEST COAST, SECONDARY PORTS:				
Oranienbaum	59°55'N, 29°47'E	In Nevskaya Guba for medium-draft vessels with best shelter in 13' to 18'. Strong easterly winds cause a heavy sea.	A dredged channel leads across the shoal fronting the harbor to 500'-wide entrance between breakwaters.	About 50 depths harbor
Vyborg	60°43'N, 28°46'E	About 3 miles below Uuras in 7 to 10 fms. and above Uuras in 4 to 7 fms. None in harbor.	Tortuous among islands with the 10 miles from Reyd Uuras decreasing from 30' to 20' at Vyborg.	Two harbors with a acres w
Uuras	60°38'N, 28°34'E	Same as Vyborg.	Same approach as Vyborg. Entrance between the breakwaters is about 110 yards wide and 24' deep.	The large depths deep deeper Ravans saari.
Makslakhden Satama (Port for Rämpeti)	60°27'N, 28°43'E	Shallow-draft anchorage in harbor but the bay Makslakhti has depths from 16' to 33'. Channel fairway passes through the bay anchorage.	A 24'-deep channel leads from the roadstead, Reyd Uuras, into S end of harbor. A 7.5'-deep channel leads to N end.	Between Revons Sari ge 16' with 26'. A channe
Koivisto	60°28'N, 23°07'E	Other nearby berths among shoaled spots.	Two deep channels lead 7 miles from Gulf of Finland and 10 miles from Vyborgskiy Zakhodnyy	A recessed Prolix about 2

TABLE VI - 1 (Continued)

BOR WATER AREA	LINEAR FEET OF WHARFAGE IN VARIOUS DEPTHS						RANGE OF WATER LEVEL	ICE CONDITIONS
cial harbors, a fishing and two shipyard harbors with depths ranging from 3'.	9,140	2,785	8,315	560	...	20,800	Lunar tides are negligible. A range of about 4' is caused by winds.	Ice breakers maintain channels except from January to end of February.
ed of the Daugava and ries for 23 miles up, about 8,900 acres.	4,180	12,535	7,375	7,685	...	31,775	Rise varies from 2' to 3' and fall from 1' to 1.5'. Spring thaws may cause rise of as much as 10' and a westerly wind may raise the level as much as 5'.	Ice breakers can keep open gation although port is u icebound from 4 to 10 between December and April.
harbor about 300 acres alf about 13' to 27' deep. ercial Harbor is about 8 of the Venta. The lower ards is about 25.5' deep out 600' to 800' wide. part gradually decreases 1' to 16' and less.	2,800	8,500	...	...	...	11,300	Normal variation is from 1' above to 1' below. Ice thaw increases depth by 4' to 5' or more.	Normally ice-free during year. Ice breakers requi severe winters.
an 600 acres in several s with depths from 18' In 1917 a German force transports and supply 6 cruisers, and 50 de-s assembled here.	...	1,080	19,580	4,205	...	25,130	Nontidal with normal variation from 3' above to 2' below mean water level.	Normally sufficiently ice-f be usable all winter breakers available for th which forms between D ber and March.
d of entrance and rn part of Kurisches ¼ miles, and the Dange part of the river Ak-	2,540	2,850	1,800	950	...	8,140	Frequently varies as much as 1' above or below mean level, occasionally as much as 2'.	Lower part frozen over s months of each year, part only few days. In winters ice breakers channel.
d of the Pregel' and its anches and three basins ted from the left bank.	5,850	6,700	23,600	2,800	1,800	40,750	(Additional wharfage on the Novyy Pregel' above Kramer bridge and on the Staryy Pregel' above Grüne bridge, but details are unknown.) In middle of bay range is from 4' above to 3' below mean level; in the Pregel', 6' above to 4' below mean level.	Closed on an average of 11. per year. Maximum was 91 days.
arbor about 80 acres, 28' Inner Harbor 700 yards bout 12 acres, 21' deep. arbor about 60 acres, 19' deep. Naval Harbor, 15 acres in 23' to 33'. smaller and shallower s.	5,930	4,705	5,480	1,385	...	17,500	No tidal influence. Water rise to 3' above and fall to 3.25' below mean level.	Port is closed on an aver less than a day each year. Baltic Sea fixed ice frequ bars the port. Format between 5 December and March.
l acres with 20' to 25' and a 11½'-deep boat of about 4 acres.	...	...	8,250	...	...	8,250	(About 800' not considered usable.) Lunar tides insignificant. Flood waters may cause rise of 4' and westerly winds 10' to 12'.	Similar to Leningrad. Ice b ers keep channel open possible.
oors, North and South, total area of about 50 ith 10' to 24' depths.	...	5,670	...	9,355	...	15,025	No tides: level is affected mainly by wind.	May close between Dec and May. Ice breakers u keep harbor open.
er portion has general of 10' to 17' with a 24'-hannel. A 24' to 36' part is between Ostrov aari and Ostrov Uuran-	1,980	590	920	3,350	...	6,840	Similar to Vyborg.	Similar to Vyborg.
off-lying islands, Ostrov ari and Ostrov Villin- neral depths are 12' to 1 central part of 20' to maintained 24'-deep l is in center.	...	...	...	3,420	...	3,420	Similar to Vyborg.	Similar to Vyborg.
on of the shoreline of Koyviston Salmi with 00 acres in 7 to 10 fms.	Similar to Vyborg.	Similar to Vyborg.

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	INLAND CLEARANCE	YEAR AND MAXIMUM KNOWN VOLUME OF TRADE THROUGH PORT		NAVAL ESTABLISHMENTS	BUILDING OR REPAIR FACILITY
open mid- dry.	5'0"-gauge connections with USSR net. A 759-cm. gauge line also leads from port. Good all- weather roads.	1937 Imports Exports Total	410,013 391,322 801,335	Was main base of the Estonian Fleet. Served as Soviet naval base (1939-1941). Used by German Navy. Present use not known, but it is the head- quarters of a naval district.	Several yards for repair. Ship- building activities suspended several years ago but may now be resumed.
navi- sually weeks mid-	There was dual-gauge trackage (4'8½" and 5'0") but probably only broad gauge remains. Railroads and good highways radiate from Riga.	1937 Imports Exports Total	1,126,426 1,480,363 2,606,789	No naval significance known.	Three small yards.
entire red in	R.R. lines of 5'0" and 60-cm. gauge connect this port with other ports and inland. Roads lead inland.	1937	353,937	Torpedo boats were stationed here in 1940.	Small repairs to hull and ma- chinery. No dry docks re- ported.
ree to Ice in ice ecem-	R.R. lines of 5'0" and 75-cm. gauge. Highway clearance is via low- grade roads.	1937 Imports Exports Total	144,797 164,998 309,795	A naval base since Czarist days. Naval portion designed as an advance base for the Soviet Baltic Fleet. Probably next to Tallinn in importance.	Naval ship repair and building yards. Two graving docks about 600' long, 85' long at mean high water level.
everal upper severe clear	Two rail lines connect into USSR broad-gauge net. Only 2 sea- sonal roads lead into the high- way net.	1937 Imports Exports Total	1,221,822 695,736 1,917,558	German base for U-boats and de- stroyers. No data on use by USSR since capture in Janu- ary 1945.	Minor repairs to hull and ma- chinery. The one yard re- ported converted to a naval re- pair base by the Germans in 1939.
6 days period	Good R.R. clearance from both sides of the river. Excellent road connection to the net- work.	1936 Coastwise Foreign Total	3,400,000 1,656,000 5,056,000	There is a small naval basin but Soviet use is unknown.	The Schichau yards have been expanded and in 1944 were re- ported to have 20 berths for submarine repairs. Two other small facilities.
age of r but iently on is id 17	Single-track R.R. connects with Kaliningrad, as does a good highway.	1937 (Mostly coastwise trade)	36,266	A U-boat training and opera- tional base during the war. Soviet use is unknown. Con- sidered a defense installation for Kaliningrad. Expansion of naval harbor was in progress.	Only small yards for repair of small ships.
reak- when	Steam R.R. line to W and elec- trified line to Leningrad. Highway to Leningrad is good; other roads are lower type.	No data.		Minelayers, minesweepers, and motor torpedo boats based here.	No major repair facilities.
umber sually	R.R. connection with Finland and USSR lines. Main roads lead in three directions. Sea terminus of Saima Canal (Say- menskiy Kanal).	No data.		No data but believed a naval air station.	Two shipyards in North Harbor for repair and construction of small craft.
	Rail and highway connections to both Finland and USSR. The Saima Canal at Vyborg pro- vides waterway to interior Fin- land.	No data.		No data.	A war-damaged small yard on Ostrov Ravansaari.
	Similar to Uuras.	No data.		No data.	No data.

TABLE VI - 1 (Continued)

WATER AREA	LINEAR FEET OF WHARFAGE IN VARIOUS DEPTHS						RANGE OF WATER LEVEL	ICE CONDITIONS
Official harbors, a fishing and two shipyard harbors with depths ranging from 13'.	9,140	2,785	8,315	560	...	20,800	Lunar tides are negligible. A range of about 4' is caused by winds.	Ice breakers maintain channels except from January to end of February.
End of the Daugava and wharves for 23 miles upstream, about 8,900 acres.	4,180	12,535	7,375	7,685	...	31,775	Rise varies from 2' to 3' and fall from 1' to 1.5'. Spring thaws may cause rise of as much as 10' and a westerly wind may raise the level as much as 5'.	Ice breakers can keep open navigation although port is usually icebound from 4 to 10 between December and April.
Harbor about 300 acres half about 13' to 27' deep. Commercial Harbor is about 8 of the Venta. The lower wharves is about 25.5' deep about 600' to 800' wide. Depth gradually decreases 1' to 16' and less.	2,800	8,500	...	...	...	11,300	Normal variation is from 1' above to 1' below. Ice thaw increases depth by 4' to 5' or more.	Normally ice-free during year. Ice breakers required severe winters.
Harbor about 600 acres in several parts with depths from 18'. In 1917 a German force transports and supply 6 cruisers, and 50 destroyers assembled here.	...	1,080	19,580	4,205	...	25,130	Nontidal with normal variation from 3' above to 2' below mean water level.	Normally sufficiently ice-free to be usable all winter. Ice breakers available for the channel which forms between December and March.
End of entrance and northern part of Kurisches Veiķis, ¼ miles, and the Dange part of the river Ak-...	2,540	2,850	1,800	950	...	8,140	Frequently varies as much as 1' above or below mean level, occasionally as much as 2'.	Lower part frozen over 8 months of each year, part only few days. In winters ice breakers channel.
End of the Pregel' and its wharves and three basins situated from the left bank.	5,850	6,700	23,600	2,800	1,800	40,750 (Additional wharfage on the Novyy Pregel' above Kramer bridge and on the Staryy Pregel' above Grüne bridge, but details are unknown.)	In middle of bay range is from 4' above to 3' below mean level; in the Pregel', 6' above to 4' below mean level.	Closed on an average of 11 per year. Maximum was 91 days.
Harbor about 80 acres, 28' deep. Inner Harbor 700 yards about 12 acres, 21' deep. Harbor about 60 acres, 19' deep. Naval Harbor, 15 acres in 23' to 33'. Harbor smaller and shallower.	5,930	4,705	5,480	1,385	...	17,500	No tidal influence. Water rise to 3' above and fall to 3.25' below mean level.	Port is closed on an average less than a day each year. Baltic Sea fixed ice frequently bars the port. Formation between 5 December and March.
Harbor about 20' to 25' and a 11½'-deep boat dock of about 4 acres.	...	...	8,250	...	...	8,250 (About 800' not considered usable.)	Lunar tides insignificant. Flood waters may cause rise of 4' and westerly winds 10' to 12'.	Similar to Leningrad. Ice breakers keep channel open possible.
Harbors, North and South, total area of about 50 with 10' to 24' depths.	...	5,670	...	9,355	...	15,025	No tides: level is affected mainly by wind.	May close between December and May. Ice breakers keep harbor open.
Harbor portion has general of 10' to 17' with a 24'-channel. A 24' to 36' part is between Ostrov Saari and Ostrov Uuran-	1,980	590	920	3,350	...	6,840	Similar to Vyborg.	Similar to Vyborg.
Off-lying islands, Ostrov Saari and Ostrov Villin-neral depths are 12' to 24' in central part of 20' to maintained 24'-deep channel is in center.	...	...	...	3,420	...	3,420	Similar to Vyborg.	Similar to Vyborg.
End of the shoreline of Koyviston Salmi with 100 acres in 7 to 10 fms.	610	550	2,135	1,710	...	5,005	Similar to Vyborg.	Similar to Vyborg.

Kaliningrad, formerly Königsberg, the principal port of East Prussia, is reached by a 20-mile-long ship channel. At the seaward entrance of the channel is the port of Baltiysk, formerly Pillau, East Prussia. In 1936 more than 5 million short tons of cargo were handled through Königsberg, now Kaliningrad. The commercial trade of Baltiysk was relatively small. Both ports had naval activities and small repair facilities. The naval area at Baltiysk was being enlarged, and the shipyard at Kaliningrad was reported to have building ways for 20 submarines.

Kronshtadt is an island naval fortification and the chief operating base of the Soviet Baltic Fleet. It also has repair facilities for all types of vessels including docks for the largest ships. The approach channel to Leningrad is immediately south of the island.

Railroad and highway clearance from the west coast ports to the interior is better than the clearance from the south coast, and greatly superior to that of the north coast. It is reported that the gage of railroads in Estonia, Latvia, Lithuania, and East Prussia has been converted from 4'8½" to 5'0", the usual gage of USSR lines.

The Stalin White Sea - Baltic Canal is a water route from the west coast to the White Sea for ships as large as an *Engels*-class destroyer.

3. SOUTH COAST.—The south coast of European USSR extends from Odessa on the west to Rostov (Rostov-na-Donu) on the east. Ports farther east on the Black Sea are discussed in JANIS 41, Chapter VI.

Tidal influence is very slight in the Black Sea and Sea of Azov. The water levels in the ports are affected by a combination of atmospheric pressure, winds, and the volume of water discharged by the rivers. The level in the Black Sea undergoes regular fluctuations throughout the year, the range being from 20 to 60 inches. The water level in the Sea of Azov is subject to considerable variations similar to those of the Black Sea. River ports, such as Rostov, are subject to wide fluctuations. Variations of water level at each port are included in discussions of the ports.

Ice, although not so much a navigation hindrance along the south coast as along the west and north coasts, does form in the winter and does present a serious obstruction to navigation. This is especially true in the northwest part of the Black Sea and in the gulf, Taganrogskiy Zaliv. The rivers usually freeze over, and navigation is extended somewhat by the use of ice breakers. Odessa and Kherson are usually kept open, Sevastopol' never freezes over, but Mariupol' and Rostov are usually closed by ice.

Odessa is one of the principal trading places on the Black Sea. Foreign imports average about 10% of all European USSR imports, and in 1937 were about 140,744 short tons. The total foreign imports through all other Black Sea ports amounted to only 14,707 short tons. Exports through Odessa amounted to only about 392,600 short tons during that year as compared with about 5,022,400 tons through all other Black Sea ports, of which only about one-fifth passed through the European USSR ports.

The city of Odessa was extensively damaged during the war, and most of its port facilities, including the shipyards, were either destroyed or damaged. Prior to the war destruction there were about 4 miles of quayage, and about 3,000 linear yards of this had water depths of 25' or more. Odessa is not a naval port.

Sevastopol', primarily a naval port and the base for the Black Sea Fleet is considered the best and safest in the Black Sea. War damage was extensive.

Kherson on the Dnepr, about 50 miles upstream, is an important coastwise shipping point. The roadstead in the river is extensive, and vessels with less than 23-foot draft, the depth of the dredged channel approach, can reach the port. There are no exclusively naval facilities at Kherson, but both commercial and naval vessels are built and repaired in the yards. The only yard in the USSR capable of building floating drydocks is reported to be at Kherson.

Mariupol' is reached by an 8¼-mile-long channel with a dredged depth of 24' in 1941. This place exported about 1,775,800 short tons of coal in 1932. There are no data on naval facilities, and the status of the two marine repair plants is unknown.

Rostov (including Nakhichevan') is on both banks of the Don, about 27 miles upstream from the mouth and 64 miles from the roadstead, Bol'shoi Taganrogskiy Reyd, in the northeastern part of the Sea of Azov. It is the largest town on the southern coast of European USSR and will probably increase in importance with the completion of the Volga - Don Canal. The channel to the city is only 12 feet deep at mean river level. There are more than 2 miles of quayage, but alongside depths are 12 feet or less.

Nikolayev, rated as a secondary port, is of great importance as the location of the chief naval shipbuilding yards in the Black Sea area. Here is located the only Black Sea yard capable of building capital ships. The port area is reached via a 28-foot-deep channel in the river Bug. The channel is about 150 feet wide and 43 miles long. There are minor naval facilities located here. The port and town were heavily damaged during the war.

All of the principal and secondary ports, except Yalta, have both rail and highway clearance. Yalta has fair highway clearance to other points on a railroad.

(2) Summary of ports

For the purpose of this study, the division of ports into categories of Principal, Secondary, and Minor Ports and Landings is entirely relative. An arbitrary classification method has been used based upon an estimated capacity of the port to receive cargo. The estimates, while considered to be of the proper order of magnitude, are not included in the study because they are insufficiently accurate for logistical planning and might be misleading in evaluation of the operational capabilities of the port.

Complete and detailed information as to the extent of war damage and subsequent reconstruction is not available. Practically all of the ports on the south coast were subjected to severe damage and destruction; port descriptions are based upon conditions in 1944 and 1945 as determinable from aerial photographs. Ports of the west and north coasts were damaged, but lack of postwar information generally restricts the treatment to prewar conditions. Considerable reconstruction is known to have been accomplished since the end of the war, but information on present day conditions is not available. The approximate dates on which the USSR military forces reoccupied the principal and secondary ports are:

Rostov	Feb. 1943	Kerch'	April 1944
Taganrog	Aug. 1943	Odessa	10 Apr. 1944
Mariupol'	Sept. 1943	Feodosiya	13 Apr. 1944
Kherson	Mar. 1944	Yalta	May 1944
Nikolayev	Mar. 1944	Sevastopol'	May 1944

A tabulation of the significant details of the principal and secondary ports is contained in TABLE VI-1. A brief summary of minor ports and landings is contained in TABLE VI-74 in Topic 67.

(3) Organization and subject treatment

(a) *Sequence.*—The ports are discussed in the order of listing in the preceding Topic (1), and under the general headings of Harbor, Terminal facilities, Storage facilities, Capacity and clearance, Supplies, Repair facilities, Trade of port, and Naval establishments. In some instances data are not available and the headings have been omitted. To the extent possible, port data are accompanied by maps of the port facilities, and as many pertinent photographs as are available to illustrate the details. Data on piers and wharves are shown in tables for each of the principal and secondary ports. Items which would have an entry of "no data are available" are omitted from the tables when it is possible to do so without affecting the format.

The chronological mixture of data necessitates frequent change of tense in descriptions of the ports. These changes should be closely noted in reading.

(b) *Definitions and units of measure.*—The depths of water are referred to a low water datum, except when specifically referred to another level. In many cases the datum is not definitely stated in the source material, and generally no attempt has been made to establish whether the datum is mean low water, lowest low water, mean sea level, or other specific datum of low water. Since the stated depths are not the results of recent soundings, they cannot be regarded as precise in any instance.

Distances are expressed in statute miles unless specifically stated otherwise. Tons are short tons (2,000 pounds) unless specified as another form of measurement.

When specific numbers of anchorage berths are stated the classification is as follows:

CLASS	RADIUS	DEPTH
	<i>Yards</i>	<i>Feet</i>
1st	500	35
2nd	400	25
3rd	300	15

(c) *References.*—Numerical references in discussions of individual ports refer to wharf facilities on the pertinent Port Facility Map.

B. Shipping routes

No definite pattern is discernible from the USSR ship movements as these are generally in the normal trade routes. The only unusual route is the northern route from Murmansk and Arkhangel'sk to the east coast of the USSR. This route is open from mid-July to the end of September, and occasionally during most of October, but ice-breaker assistance is required along virtually the whole route. Routes are briefly measured in Topic 68.

61. PRINCIPAL PORTS, NORTH COAST

A. Arkhangel'sk (64°28'N, 40°32'E)

The city (1942 population, 300,000) is located on the right bank at the mouth of the river Severnaya Dvina, and at the head of the deltaic formation of islands stretching for 26 miles to the gulf Dvinskaya Guba. At Arkhangel'sk the river divides into three principal and numerous secondary tidal estuaries to flow through the delta to the gulf and White Sea (Beloye More).

The port of Arkhangel'sk extends southward from the northern end of the island Ostrov Mud'yugskiy along several distributaries and about five miles above Arkhangel'sk

in the Severnaya Dvina (FIGURE VI-1). Individual sections of the port area are distinctly named. The city, Arkhangel'sk, is the administrative center of the region, and the port is the most important in arctic waters. More than 57,000 lineal feet of wharves in 12- to 28-foot depths are available for shipment of about 82% of the White Sea export trade. The average annual export during 1934-1937 was 2,026,000 short tons, or about 14% of all USSR shipments through ports. Imports during 1935-1937 through Arkhangel'sk amounted to an annual average of only 2,800 short tons.

Lumber is 80% of the export trade, and more than 60% of the principal wharfage is utilized primarily for this commodity. About 20% of the wharfage, distributed among Arkhangel'sk railroad station, Bakaritsa, and Ekonomiya, provides the facilities for general cargo trade. These three installations are the only ones that are adequately equipped with hoisting, storage, and clearance facilities considered essential for general commercial port operations. The remainder is used for local trade, coal-ing, ship repair and idle berthing. There is an extensive amount of wharfage for shallow-draft river craft. A summary of the principal wharfage is shown in the following tabulation:

USE	LOCATION	TOTAL WHARFAGE Feet
General cargo, off-shore trade:	Arkhangel'sk R. R. Sta.	3,080
	Bakaritsa	6,830
	Ekonomiya	2,420
Timber export, off-shore trade:	Arkhangel'sk	2,480
	Bakaritsa	220
	Ostrov Brevennik	10,410
	Kegostrov	2,750
	Ostrov Khabarka	1,980
	Ostrov Povrakul'skiy	6,425
	Solombala	8,060
General cargo, river trade:	Arkhangel'sk	4,025
Ship repair and idle berthing:	Ostrov Moseyev	1,400
	Solombala	5,125
Coaling:	Arkhangel'sk R. R. Sta.	800
	Ekonomiya	600
	Ostrov Moseyev	1,000
Total		57,605

The two shipyards of the port area are located at Solombala and on the causeway-connected island, Ostrov Moseyev. Work can be performed on hulls and machinery of medium-sized cargo vessels. A "winter harbor" is located in the basin formed by these two islands.

Naval activities are centered at Solombala and consist of the main operating and rear base for the White Sea Flotilla and the rear base of the Northern Fleet.

Operations in the port area are limited to the ice-free period, about 15 May to 15 December, and to vessels with draft which will clear the Berezovyy Bar. This bar was reported (1941) as having a depth of 23.5 feet at high water. During World War II, however, Liberty-type vessels were delivering lend-lease goods to Bakaritsa where there are at least ten berths adequate for Liberty-type ships. In addition to the larger berths, another 150 ships ranging upward from 200-foot coasters with 12-foot draft may be berthed simultaneously.

(1) Harbor

The estuarine harbor of Arkhangel'sk commences at the first anchorage, about two miles south from the

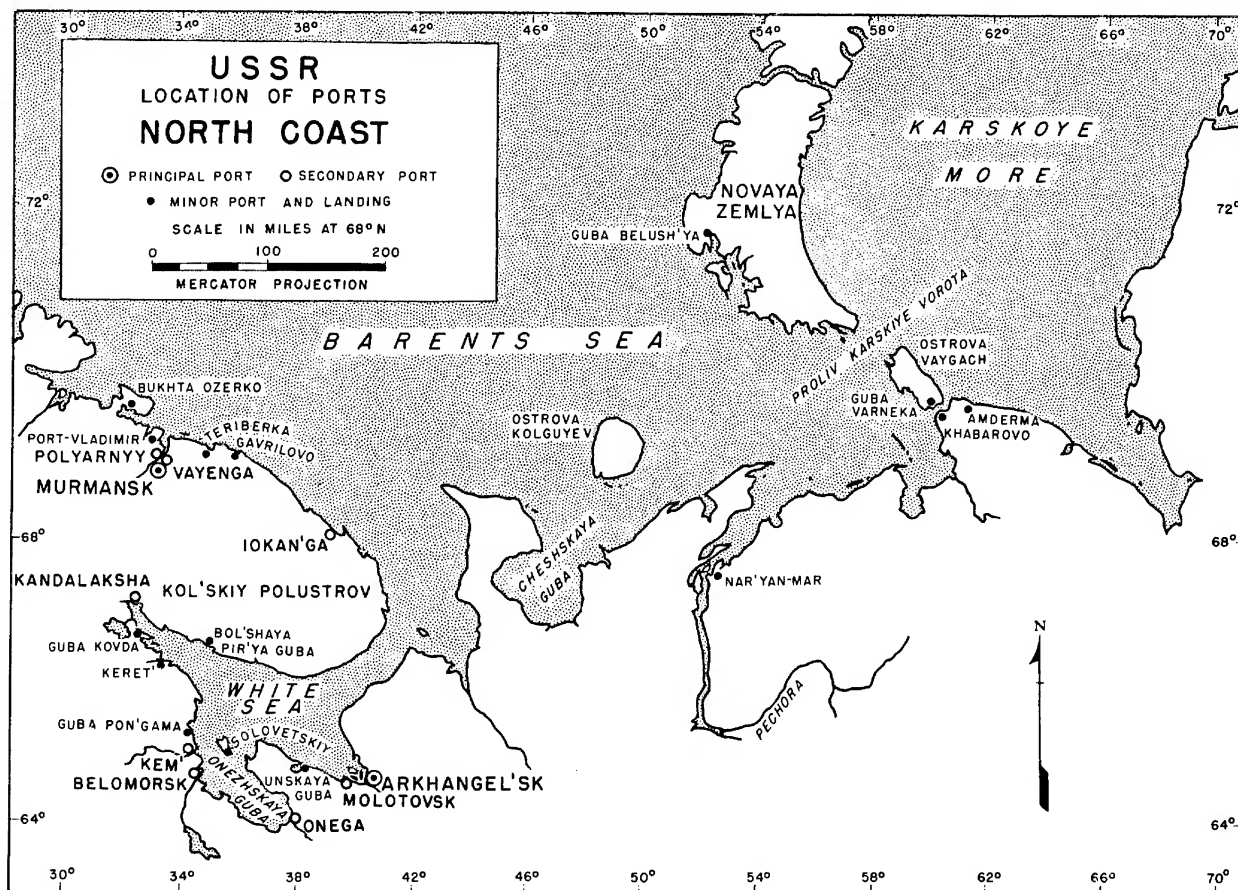


FIGURE VI-1. Location of ports on the north coast of European USSR.

outer edge of Berezovyy Bar and on the west side of the maintained channel. It extends inland to the lumber wharves above Bakaritsa. Between these points there are anchorages in the deeper channels, and wharves are on the mainland and larger islands.

The elevations of the numerous deltaic islands are about 14 feet or less, and islands near the gulf coast become inundated during exceptionally high water. All of the islands are composed of clay, earth, and sand and have steep coasts. Vegetation is limited to grass, low willows, and shrub birch on most of the islands, but some of the islands have sandy hillocks on which large pine trees grow. Several villages and some government installations are located on the larger islands.

These numerous islands are formed by many interlacing shallow secondary channels which connect three principal distributaries. The Korabel'nyy Rukav (or Berezovyy) with its secondary channel, the Maymaksa, is the most important estuary of the Severnaya Dvina and the one used by oceangoing vessels. The Korabel'nyy Rukav is navigable only by shallow-draft craft from a point west-by-north of the island Bol'shoy Chaichiy Ostrov, to the anchorage on the southwest side of the island Ostrov Brevennik. Deep-draft vessels use the Maymaksa from its confluence with the Korabel'nyy Rukav, northwest of Bol'shoy Chaichiy Ostrov, to the southern tip of Ostrov Brevennik where it again flows with the Korabel'nyy Rukav. (Some sources refer to the section of the Korabel'nyy Rukav from Arkhangel'sk to the southern tip of Ostrov Brevennik as the "upper section of the Berezovyy

Channel" and to the section from the confluence of the Maymaksa and the Korabel'nyy Rukav (at 64°47'N, 40°24'E) about one mile northwest of Bol'shoy Chaichiy to the Berezovyy Bar as "the lower section of the Berezovyy Channel." USSR sources give Berezovyy as the secondary name for the entire estuary.) The principal wharves and anchorages are located on the Severnaya Dvina, Maymaksa, Korabel'nyy Rukav, and Nikol'skiy Rukav.

Severnaya Dvina.—Off the south bank of Arkhangel'sk the river is ½ to 1 mile wide with mid-channel low water depths of 24 to 68 feet; farther upstream (south) the river widens but is shallower and contains numerous islands and bars. Wharves of Arkhangel'sk on the right bank, Arkhangel'sk railroad station and Bakaritsa on the left bank are located on this 5-mile stretch. These facilities on the left bank are the only ones that can be cleared directly inland without another water lift.

Maymaksa.—This secondary channel of the Korabel'nyy Rukav is about 12 miles long with widths of about 700 yards at the northern entrance, 140 yards near the southern end, and about 400 yards at the southern tip of Ostrov Brevennik where it again meets the Korabel'nyy Rukav. Except for some narrow bars that must be dredged, the depths are from 25 to 45 feet, forming the deepest approach to Arkhangel'sk. Along both sides of the Maymaksa are extensive timber-handling wharves and the general cargo port of Ekonomiya is on the northern part of the island Ostrov Povrakul'skiy.

Korabel'nyy Rukav.—There are several anchorages in this channel between the bar and confluence with the Maymaksa. The 10-mile stretch from the northern union with the Maymaksa to the anchorage on the southwest side of Ostrov Brevennik is used only by shallow-draft craft. The width of this section varies from 25 to 500 yards and the depth varies from 6 to 46 feet, but the remainder is navigable by deep-draft ships. On the southwest side of Ostrov Brevennik are 4,700 feet of wharves and abreast of them is an anchorage suitable for four or five vessels in 20 to 27 feet at low water.

Nikol'skiy Rukav.—This is the estuary which flows to the west from the Severnaya Dvina. About 2,700 feet of timber-handling wharfage are located on the south side of the island, Kegostrov. About 8 miles westward of Arkhangel'sk, at Laya, on the river Laya, are a small graving dock and a marine repair shop for small craft and minor work. The narrowest part of the upper (eastern) section is about 400 yards wide, but the depths are shallow except for the approaches to the facilities. It is too shallow for deep-draft vessels except in the vicinity of Arkhangel'sk and at its western end where it flows into the sea. The newly developed port of Molotovsk is located at the western end.

(a) *Entrance channel.*—Approach to Arkhangel'sk is made through the Severnaya Dvina delta via the channels Korabel'nyy Rukav (or Berezovyy) and Maymaksa by deep-draft vessels. The drafts of vessels entering the port are controlled by the dredge depths in the 350-foot fairway through the bar. In 1941 there was a high-water depth of 23.5 feet over the bar. In the same year conditions were reported to allow vessels with 22-foot freshwater draft to proceed to Arkhangel'sk. During World War II, however, Liberty-type vessels were proceeding to Bakaritsa, above Arkhangel'sk, where 50-ton tanks were discharged. Depths and alignments of the fairway through the channels are subject to frequent changes due to silting and ice erosion, and the services of a local pilot are essential. Normally dredging is required in some sections of the channels to maintain project depths. The approach to Arkhangel'sk is well marked by navigational aids, including the Severo-Dvinskiy Plovuchiy Mayak (lightship) 2.5 miles northwest of the entrance through the bar, numerous lighted channel buoys, beacons, and ranges.

(b) *Anchorage*

1) North and west of the lightship in the gulf, temporary anchorage is available for more than a hundred vessels in any required depth up to 60 feet over mud and sand. This area is exposed to west-through-north winds.

2) Between the lightship and the entrance through the bar, about 3.5 miles, there is anchorage adjacent to the navigated channel for about 15 vessels in 24 to 36 feet over sand and mud. Ships wait here for sufficient water to cross the bar, complete loading, or lighten ship to a draft that will cross the bar. A heavy swell sets into this anchorage during fresh westerly winds and at ebb stream a cross sea is created with a dangerous surf on the bar.

3) The first anchorage inside the bar is about 2 miles south in the channel, but so as not to interfere with the passage of vessels, in 20 to 32 feet at low water. When necessary, ships wait here for sufficient water to cross the bar.

4) One mile farther south a 600- to 900-yard wide anchorage extends for 1.5 miles to the southeastward pro-

viding about 400 acres in 21 to 36 feet at low water. Vessels wait here for gales to abate.

5) In the Maymaksa, 3 miles north of Ekonomiya, there is an anchorage where ships engaged in foreign trade await customs inspection. Depths are not stated but should be not less than 22 feet to conform with the stated navigability.

6) In the roads abreast the northern end of Solom-bala and the island Ostrov Khabarka, vessels can anchor parallel to the channel in 20 to 30 feet at low water.

7) About a mile north of Ostrov Khabarka and abreast the southwest coast wharves of Ostrov Brevennik there are about 80 acres in low water depths of 20 to 27 feet.

8) There is convenient and spacious anchorage in the roads off the southern face of Arkhangel'sk where vessels can anchor in the stream in 30 to 68 feet of water.

9) The limited widths of the anchorages along the several channels eliminates classification of all but two or three as second-class anchorage berths. There are numerous third-class anchorages of 300-yard-diameter circles in 18 feet of water. Mooring with bow and stern anchors, however, will enable anchoring of 30 to 40 ocean-going ships. During March 1945 there were 32 merchant vessels of various sizes, plus escorting warships, anchored in the approaches.

(c) *Hydrographic features*

1. *TIDES AND CURRENTS.*—The lunital interval at Berezovyy Bar is 5 hours and 37 minutes, and at Arkhangel'sk, 7 hours and 20 minutes. At the bar, mean high water springs rise 4.0 feet and neaps, 3.5 feet. At Arkhangel'sk mean high water springs rise 3 feet and neaps, 2.5 feet.

At the bar, the flood tide begins about 4.5 to 5 hours before high water, or from 1 to 2 hours after the moon's meridian passage, and continues for about 5 hours. The ebb tide begins an hour after high water, or from 6 to 7 hours after the moon's meridian passage, and continues nearly 7 hours. The tidal streams are slack for about half an hour at the end of both flood and ebb tides. The flood attains a velocity of 1 knot and the ebb from 2 to 3.75 knots.

Wind force and direction have considerable influence on the rate and duration of the tidal streams; fresh westerly to northerly winds cause the ingoing stream to begin earlier and last longer than usual, with an increased rate, and the outgoing stream to begin later and last a shorter time, with a decreased rate. Easterly and southerly winds have the reverse effect.

The normal duration of the flood tide at Arkhangel'sk is between 6 and 6.5 hours and that of the ebb, from 5.5 to 6 hours. These times are affected by northerly winds which prolong high water for an hour or more. In the narrow parts of the channel the current may reach a velocity of 1.5 knots.

2. *ICE.*—The port of Arkhangel'sk is officially opened and closed according to shipping requirements and yearly ice conditions. In recent years the port has, on an average, been open to navigation with ice breaker assistance from the 15th of May to the 15th of December. Throughout the winter of 1943-1944 the Bakaritsa terminal was kept open to merchant shipping by ice breakers, but this is considered to be most unusual.

About the end of October, the river in the vicinity of the city and the principal channels lower down generally freeze over smoothly, but in some years the new ice breaks

BAKARITSA TERMINAL**Key to installations:**

1. Sawmill.
2. Lumber storage yard.
3. Barracks.
4. Barracks.
5. Vehicle park.
6. Barracks.
7. R.R. yard and supply dump.
8. General cargo terminal.
9. General cargo terminal.
10. Log rafts.
11. Lumber loading terminal.
12. R.R. yard and lumber storage area.
13. R.R. marshalling yard.
14. Barracks.
15. Aircraft assembly plant.
16. Airfield.

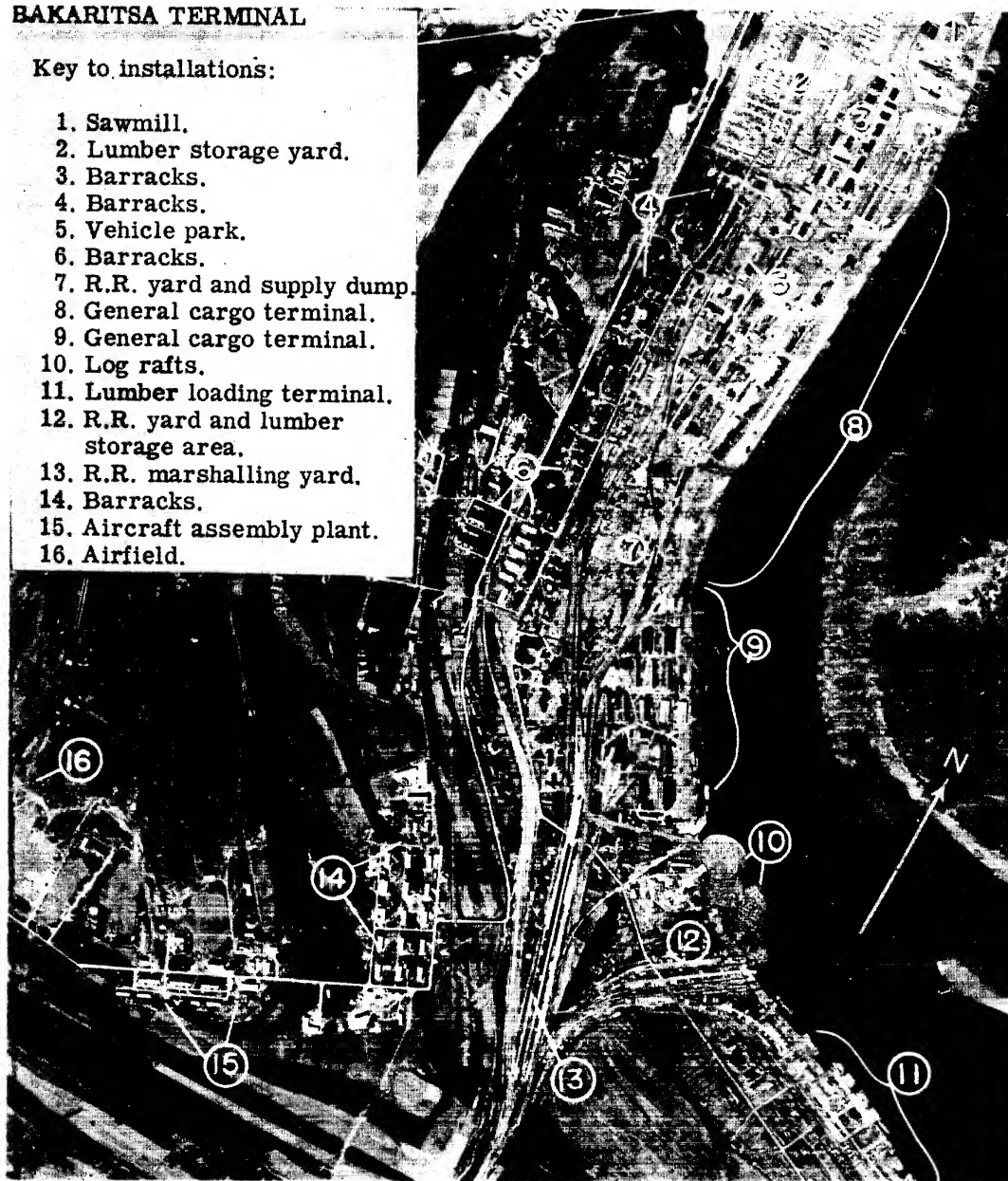


FIGURE VI-2. Arkhangel'sk.

The principal wharves and facilities at Bakaritsa on the left bank of the Severnaya Dvina. 1943.

up into ice blocks. The small sheltered channels and the upper part of the river are frozen a few days earlier. The mouths of the broad reaches and narrow channels with strong currents are frozen a week later.

The break-up of the ice off the mouths of the Severnaya Dvina occurs about the middle of May, and at this time the port usually is reopened. About two weeks before the break-up the water in the river commences to rise in consequence of melting of snow in the interior. When the ice breaks up it comes down very slowly at first, and then moves in large compact blocks through all the channels; finally, as a close mass, it carries down with it everything

on the way. Sometimes in shallow or narrow places the ice is pressed down to the bottom, and the water, being thus impeded, rises and inundates the low ground and islands. The height of the inundation depends on the rapidity with which the snow melts, on the thickness and hardness of the ice, and also on the force and direction of the wind when the ice in the lower part of the river breaks up. The city of Arkhangel'sk and other points on the mainland are of sufficient elevation to escape these inundations, but most of the islands are affected.

(d) *Local weather.*—The mean annual temperature at Arkhangel'sk is 32.3°F., with an extreme range from

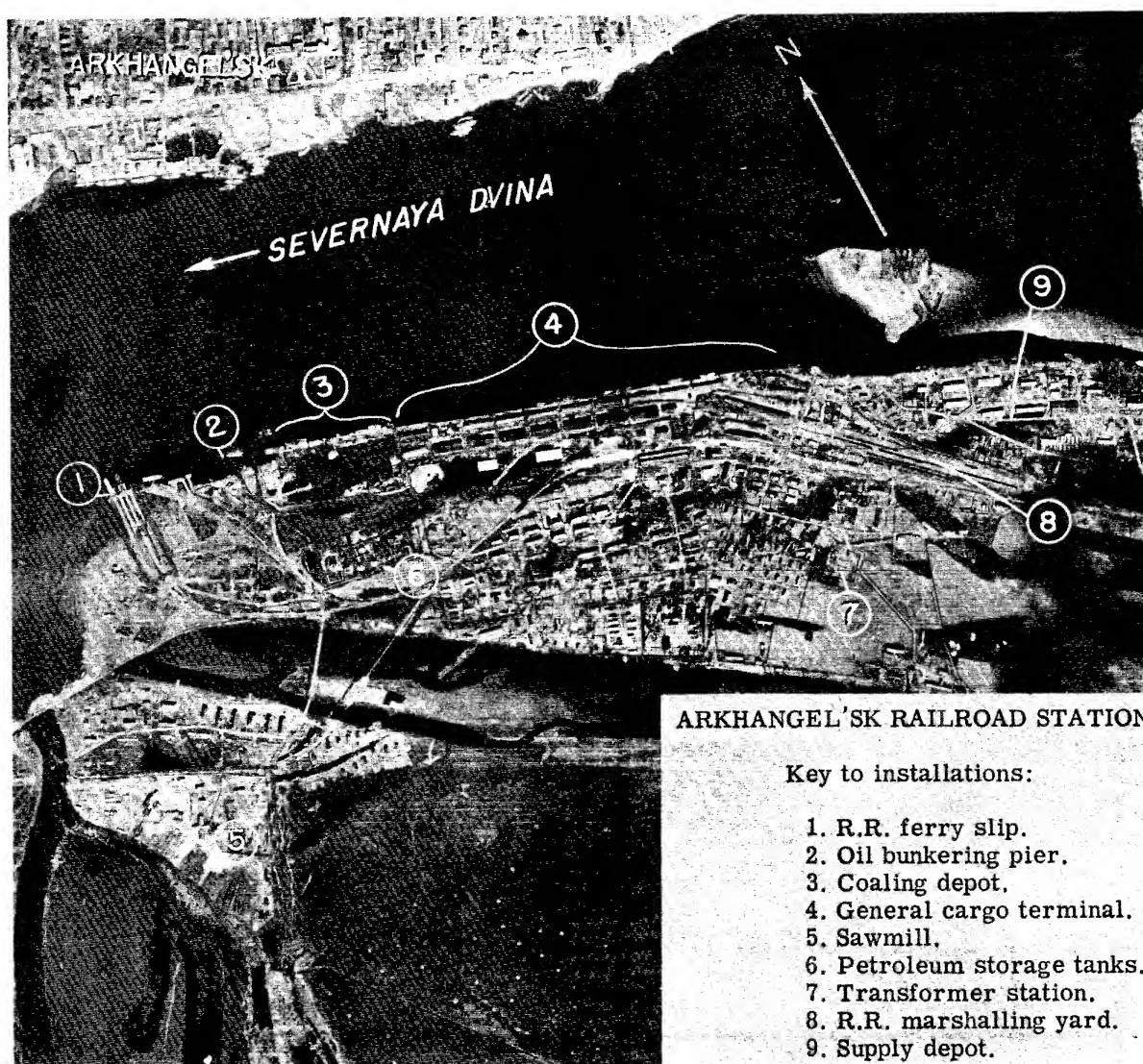


FIGURE VI-3. Arkhangel'sk.

Wharves and adjacent area on the left bank of the Severnaya Dvina at Arkhangel'sk railroad station. Across the river, at top left, is a part of the city waterfront. 1943.

94°F. to -49°F. The average annual precipitation is 18.03 inches and the mean relative humidity, 82 percent. Prevailing winds during the winter are east through south to west, and during the summer are west through north to northeast. Fog is prevalent during summer months.

(2) Terminal facilities

(a) *Piers and wharves.*—The port of Arkhangel'sk has a total of over 57,000 linear feet of wharves with depths alongside ranging from 12 to 28 feet. In addition, there is a considerable amount of wharfage suitable only for river and harbor craft.

Despite the sizable berthing capacity of the port, less than 30 percent consists of terminals equipped for normal cargo discharge and clearance operations from ocean-going ships. Over half the wharves are used solely for lumber shipment and are largely lacking in means of overland clearance; none of these is served by rail, and road connections are poor.

Three sections of the port, Bakaritsa, Arkhangel'sk railroad station, and Ekonomiya, comprise the general cargo terminals for oceangoing ships.

Bakaritsa, located on the left bank of the Severnaya Dvina a short distance above Arkhangel'sk, is the largest



FIGURE VI-4. Arkhangel'sk.

The conflux of the Maymaksa and Kusnechikha distributaries of the Severnaya Dvina, showing the facilities at Ekonomiya. 1942.

import terminal in the port (FIGURE VI-2). The long marginal wharf is equipped with mechanical handling facilities, rail spurs, and transit sheds, and an extensive area adjacent is occupied by a military supply depot with numerous large warehouses, barracks, and a railroad marshalling yard. During World War II, Bakaritsa was the principal discharge terminal for lend-lease shipments entering through Arkhangel'sk, and 50-ton tanks were loaded directly to railway cars from the ships.

Arkhangel'sk railroad station, on the left bank of the Severnaya Dvina just opposite Arkhangel'sk city, is the terminus of the railroad and an important cargo terminal and supply depot (FIGURE VI-3). Its long marginal wharf is divided into a general cargo section and a coaling section. Mechanical handling devices and rail spurs are installed throughout, and large transit sheds are located in the general cargo section. Facilities in the adjacent upland include several groups of warehouses, coal stockpiles,

a petroleum storage depot, and a railroad marshalling yard. The railroad ferry terminal located here connects with the one at Arkhangel'sk.

Ekonomiya, downstream from Arkhangel'sk on the Maymaksa, was developed as a cargo terminal during World War II (FIGURE VI-4). Berthing facilities consist of two long marginal wharves equipped with cranes and railroad spurs. Two berths are used for coaling and the rest for general cargo. Warehouses and barracks occupy the adjacent upland and all parts of the terminal area are served by sidings and spurs of a railroad line running southward over permanent bridges to Arkhangel'sk where connection is made with the main line by ferry across the Severnaya Dvina. In winter the connection is made by a temporary bridge over the ice on the Severnaya Dvina.

Dimensions and constructional details of the principal piers and wharves at Arkhangel'sk are shown in TABLE VI-2. All known transit sheds are listed.

TABLE VI - 2
PIERS AND WHARVES
Port of Arkhangel'sk

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 9)		
	1 Wharf	2 Bakaritsa Wharf	3 Wharf
Location	Left bank of main river channel at Bakaritsa.	Left bank of main river channel at Bakaritsa.	Left bank of main river channel at Bakaritsa.
Use	General cargo and shipment of lumber.	Discharging import general cargo.	Shipment of lumber.
Type of construction	Offshore wharf with 4 shore connections; open piling, timber deck.	Marginal wharf of open piling, heavy timber deck.	Offshore wharf with 2 shore connections; open piling, timber deck.
Dimensions (feet):			
Length	730 (face).	3,860+610+1,630 (face).	220 (face).
Depth of water (m. l. w.)	18.	28.	23.
Berthing space available	730.	3,860+610+1,630.	220.
Width of apron	Open wharf 50 ft. wide.	Open wharf 150 ft. wide.	Open wharf 35 ft. wide.
Height of deck above low water	No data.	9.	No data.
Capacity per sq. ft. (pounds)	do.	150 to 200.	Do.
Mechanical handling facilities.	do.	One 2- to 3-ton electric crane, one 20-ton electric crane, six 5-ton traveling cranes, twelve 5- to 7-ton R.R. cranes (possibly two are 18-ton), four portable electric conveyors.	Do.
Rail (5'0" gage) and road connections.	Tracks on upland adjacent to wharf. Truck access to wharf.	Double-track rail spurs run entire length of wharf, additional spurs and sidings on upland; truck access to wharf.	No rail; truck access to wharf.
Electricity	No data.	220-v. current available; wharf lighted.	No data.
Remarks	.....	Continuity of wharf broken by gap and angle. Wharfage designated as Berths Nos. 132 to 145. 50-ton tanks discharged directly to railroad cars during World War II from Liberty-type vessels.	.....

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 9)		
	4 Arkhangel'sk Station Wharf	5 Wharf	6 Wharf
Location	Left bank of main river channel at Arkhangel'sk Station.	Kegostrov, on Nikol'skiy Rukav.	Kegostrov, on Nikol'skiy Rukav.
Use	Handling general cargo, overseas trade.	Shipment of lumber.	Shipment of lumber.
Type and construction	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.
Dimensions (feet):			
Length	3,500+380 (face).	540+680 (face).	250 (face).
Depth of water (m. l. w.)	16 to 18.	20.	20.
Berthing space available	3,500+380.	540+680.	250.
Width of apron	30 at sheds; open elsewhere.	Open wharf.	Open wharf.
Height of deck above low water.	6.	No data.	No data.
Transit sheds:	Nine sheds.	None.	None.
Length and width (feet)	210 by 50 (each shed).	.....	.....
Number of floors	One (all sheds).	.....	.....
Total floor area (sq. ft.)	94,500.	.....	.....
Mechanical handling facilities	Two 2.5-ton and one 2-ton cranes, all equipped with grab buckets; several traveling cranes of unknown capacity.	No data.	No data.
Rail (5'0" gage) and road connections.	One track on apron and two at rear of transit sheds; extensive classification yard just SE of terminal. Truck access to wharf.	No rail; truck access to wharf.	No rail; truck access to wharf.

TABLE VI - 2 (Continued)

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: Figure VI - 9)		
	7 Wharf	8 Wharf	9 Wharf
Location	Kegostrov, on Nikol'skiy Rukav.	Right bank of main river channel at E end of Arkhangel'sk city.	Right bank of main river channel at E end of Arkhangel'sk city.
Use	Shipment of lumber.	Shipment of lumber.	Shipment of lumber.
Type and construction	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.
Dimensions (feet):			
Length	220 + 1,060 (face).	1,950 + 330 (face).	200 (face).
Depth of water (m. l. w.)	20.	23.	12.
Berthing space available	220 + 1,060.	1,950 + 330.	200.
Width of apron	Open wharf.	Open wharf.	Open wharf.
Transit sheds:	None.	Two sheds.	None.
Length and width (feet)	.....	200 by 55 (each shed).	.....
Number of floors	.....	One (both sheds).	.....
Total floor area (sq. ft.)	.....	22,000.	.....
Rail and road connections	No rail; truck access to wharf.	No rail; truck access to wharf.	No rail; truck access to wharf.
Remarks	Continuity of wharf broken by angle.	Continuity of wharf broken by angle.	
DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: Figure VI - 9)		
	10 Wharf	11 Wharf	12 Bankovskaya Pier
Location	Arkhangel'sk city waterfront.	Arkhangel'sk city waterfront.	Arkhangel'sk city waterfront.
Use	Handling general cargo in local trade.	Handling general cargo in local trade.	Handling general cargo in local trade.
Type and construction	Marginal wharf with masonry walls retaining earth fill.	Marginal wharf with masonry walls retaining earth fill.	Solid pier with masonry walls retaining earth fill.
Dimensions (feet):			Face N Side S Side
Length	920 + 220 (face).	340 (face).	660 + 120 200 140
Depth of water (m. l. w.)	12.	12.	18 ... 12
Berthing space available	920 + 220.	340.	660 + 120 ... 140
Width of apron	25.	Open wharf.	20 at sheds.
Capacity per square foot	Unlimited.	Unlimited.	Unlimited.
Transit sheds:	Seven sheds.	None.	Three sheds.
Length and width (feet)	Four sheds, 70 by 35; two sheds, 85 by 40; one shed 125 by 40.	.....	Two sheds, 180 by 60; one shed 165 by 50.
Number of floors	One (all sheds).	.....	One (all sheds).
Total floor area (sq. ft.)	21,600.	.....	29,850.
Rail and road connections	No rail; truck access to wharf.	No rail; truck access to wharf.	No rail; truck access to pier.
Remarks	.....	.....	Continuity of pier face broken by angle.
DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: Figure VI - 9)		
	13 Sobornaya Pier	14 Zagranichnaya Pier	15 Coal Wharf
Location	Arkhangel'sk city waterfront.	Arkhangel'sk city waterfront.	Ostrov Moseyev (S of Solombala).
Use	Handling general cargo in local trade.	Handling general cargo in local trade.	Handling coal.
Type and construction	Solid pier with masonry walls retaining earth fill.	Solid L-head pier with masonry walls retaining earth fill.	Masonry quaywall retaining solid fill.
Dimensions (feet):	Face N Side S Side	PIERHEAD Inner PIER SIDES NW SE	
Length	105 245 245	Face Side Side Side	1,000 (face).
Depth of water (m. l. w.)	18 12 12	540 270 45 220	22.
Berthing space available	105 245 245	18 to 21 12 18 12 to 21	1,000.
Width of apron	Open 25 25	540 270 .. 220	Open wharf.
Capacity per square foot	Unlimited.	15 at sheds 15 15	No data.
Transit sheds:	One shed.	Unlimited.	None.
Length and width (feet)	140 by 50.	Two sheds.	.....
Number of floors	One.	165 by 70; 165 by 60.	.....
Total floor area (sq. ft.)	7,000.	One (both sheds).	.....
Mechanical handling facilities	No data.	21,450.	.....
Rail and road connections	No rail; truck access to pier.	One 25-ton crane, hand-operated.	Four overhead conveyor systems with grab buckets.
Remarks	Basins formed between this and piers adjacent on either side serve as winter lay-up moorings. Both basins afford protection from ice drive in spring.	No rail; truck access to pier. Basin formed between pierhead and shore serves as winter lay-up moorings. Shelter is afforded from ice drive in spring.	No rail; truck access to wharf. Conveyors may obstruct general cargo handling.

TABLE VI-2 (Continued)

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI-9)		
	16 Wharf	17 Wharf	18 Wharf
Location	Ostrov Moseyev.	Ostrov Moseyev.	Ostrov Moseyev.
Use	Idle berthing, fitting out, and general cargo handling.	Idle berthing, fitting out, and general cargo handling.	Idle berthing, fitting out, and general cargo handling.
Type and construction	Marginal wharf with masonry walls and solid fill.	Masonry quaywall retaining solid fill.	Masonry quaywall retaining solid fill.
Dimensions (feet):			
Length	Face 230 E Side 170	310 (face).	350+340 (face).
Depth of water (m. l. w.)	17	17.	17.
Berthing space available	230	310.	350+340.
Width of apron	Open	Open wharf.	Open wharf.
Rail and road connections	No rail; truck access to wharf.	No rail; truck access to wharf.	No rail; truck access to wharf.
Remarks	.....	.....	Wharf divided into 2 sections by intervening slip.

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI-9)		
	19 Wharf	20 Wharf	21 Wharf
Location	Solombala, "Winter Harbor".	Dockyard Basin, Solombala, "Winter Harbor".	Dockyard Basin, Solombala, "Winter Harbor".
Use	Idle berthing, fitting out, and general cargo handling.	Ship repair and fitting out.	Ship repair and fitting out.
Type and construction	Marginal wharf of open piping, timber deck.	Masonry quaywall retaining solid fill.	Masonry quaywall retaining solid fill.
Dimensions (feet):			
Length	700 (face).	570 (face).	SE Face 200 SW Face 180
Depth of water (m. l. w.)	17 to 24.	17 to 24.	17 to 24
Berthing space available	700.	570.	200
Width of apron	Open wharf.	Open wharf.	Open
Capacity per square foot	No data.	Unlimited.	Unlimited
Rail and road connections	No rail; truck access to wharf.	No rail; truck access to wharf.	No rail; truck access to wharf.
Electricity	.....	110 and 220 v., a. c. and d. c.	110 and 220 v., a. c. and d. c.

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI-9)		
	22 Wharf	23 Wharf	24 Wharf
Location	Dockyard Basin, Solombala, "Winter Harbor."	Dockyard, Solombala, "Winter Harbor."	Dockyard, Solombala, W side.
Use	Ship repair and fitting out.	Ship repair and fitting out.	Ship repair and fitting out.
Type and construction	Masonry quaywall retaining solid fill.	Masonry quaywall retaining solid fill.	Masonry quaywall retaining solid fill.
Dimensions (feet):			
Length	280+300 (face).	270+280+230 (face).	600+170+350 (face).
Depth of water (m. l. w.)	17 to 24.	24.	18 to 24.
Berthing space available	280+300.	270+280+230	170+350.
Width of apron	Open wharf.	Open wharf.	Open wharf.
Rail and road connections	No rail; truck access to wharf.	No rail; truck access to wharf.	No rail; truck access to wharf.
Electricity	110 and 220 v., a. c. and d. c.	110 and 220 v., a. c. and d. c.	110 and 220 v., a. c. and d. c.
Remarks	Two sheds at rear of wharf with total floor area of 19,500 sq. ft.	.....	Floating dry dock occupies 600-foot portion of wharf.

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI-9)		
	25 Wharf	26 Wharf	27 Wharf
Location	Solombala, W side.	Solombala, W side.	Solombala, W side.
Use	Ship repair and fitting out.	Ship repair and fitting out.	Ship repair and fitting out.
Type and construction	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.
Dimensions (feet):			
Length	290+310 (face).	230 (face).	165 (face).
Depth of water (m. l. w.)	24.	24.	24.
Berthing space available	290+310.	230.	165.
Width of apron	Open wharf.	Open wharf.	Open wharf.
Rail and road connections	No rail; truck access to wharf.	No rail; truck access to wharf.	No rail; truck access to wharf.
Remarks	Two sheds at rear of wharf, with total of 18,000 sq. ft. of floor space.	.....	.....

TABLE VI - 2 (Continued)

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 9)		
	28 Wharf	29 Wharf	30 Wharf
Location	Solombala, W side.	Solombala, W side.	Solombala, W side.
Use	Shipment of lumber, general cargo.	Shipment of lumber.	Shipment of lumber.
Type and construction	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.
Dimensions (feet):			
Length	880 (face).	950 (face).	800 (face).
Depth of water (m. l. w.)	20 to 22.	22.	20.
Berthing space available	880.	950.	800.
Width of apron	Open wharf.	Open wharf.	Open wharf.
Rail and road connections	No rail; truck access to wharf.	No rail; truck access to wharf.	No rail; truck access to wharf.

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 9)		
	31 Wharf	32 Wharf	33 Wharf
Location	Solombala, W side.	Solombala, W side.	Solombala, W side.
Use	Shipment of lumber.	Shipment of lumber.	Shipment of lumber.
Type and construction	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.
Dimensions (feet):			
Length	720+145+760 (face).	185+1,810 (face).	1,810.
Depth of water (m. l. w.)	20.	20 to 22.	20 to 22.
Berthing space available.	720+145+760.	185+1,810.	1,810.
Width of apron	Open wharf.	Open wharf.	Open wharf.
Rail (5'0" gage) and road connections.	R.R. spur terminates at N end of wharf; truck access to wharf.	R.R. spur terminates at N end of wharf; truck access to wharf.	R.R. spur terminates at S end of wharf; truck access to wharf.

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 9)		
	34 Wharf	35 Wharf	36 Wharf
Location	Ostrov Khabarka (opposite Solombala).	Ostrov Brevennik, on the Korabel'nyy Rukav.	Ostrov Brevennik, on the Korabel'nyy Rukav.
Use	Shipment of lumber.	Shipment of lumber.	Shipment of lumber.
Type and construction	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.
Dimensions (feet):			
Length	1,980 (face).	1,110+250 (face).	920 (face).
Depth of water (m. l. w.)	20.	20.	20.
Berthing space available	1,980.	1,110+250.	920.
Width of apron	Open wharf.	Open wharf.	Open wharf.
Rail and road connections	No rail; truck access to wharf.	No rail; truck access to wharf.	No rail; truck access to wharf.

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 10)		
	37 Wharf	38 Wharf	39 Wharf
Location	Ostrov Brevennik, on the Korabel'nyy Rukav.	Ostrov Brevennik, on the Korabel'nyy Rukav.	Ostrov Brevennik, on the channel, Maymaksa.
Use	Shipment of lumber.	Shipment of lumber.	Shipment of lumber.
Type and construction	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.
Dimensions (feet):			
Length	970 (face).	1,190+250 (face).	1,200 (face).
Depth of water (m. l. w.)	20.	20.	20.
Berthing space available	970.	1,190+250.	1,200.
Width of apron	Open wharf.	Open wharf.	Open wharf.
Rail and road connections	No rail; truck access to wharf.	No rail; truck access to wharf.	No rail; truck access to wharf.

TABLE VI - 2 (Continued)

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 10)		
	40 Wharf	41 Wharf	42 Wharf
Location	Ostrov Brevennik, on the Maymaksa.	Ostrov Brevennik, on the Maymaksa.	Ostrov Povrakul'skiy, on the Maymaksa.
Use	Shipment of lumber.	Shipment of lumber.	Shipment of lumber.
Type and construction	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.
Dimensions (feet):			
Length	1,320 (face).	1,080 (face).	960+550 (face).
Depth of water (m. l. w.)	20.	20.	20.
Berthing space available	1,320.	1,080.	960+550.
Width of apron	Open wharf.	Open wharf.	Open wharf.
Rail and road connections	No rail; truck access to wharf.	No rail; truck access to wharf.	No rail; truck access to wharf.
Remarks	Wharf face irregular.	Wharf face irregular.	Wharf face irregular; continuity broken by angle.

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 10)		
	43 Wharf	44 Wharf	45 Wharf
Location	Ostrov Povrakul'skiy, on the Maymaksa.	Ostrov Povrakul'skiy, on the Maymaksa.	Ostrov Brevennik, on the Maymaksa.
Use	Shipment of lumber.	Shipment of lumber.	Shipment of lumber.
Type and construction	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.
Dimensions (feet):			
Length	400+1,550 (face).	640+830 (face).	1,750 (face).
Depth of water (m. l. w.)	20.	20.	20.
Berthing space available	400+1,550.	640+830.	1,750.
Width of apron	Open wharf.	Open wharf.	Open wharf.
Rail and road connections	No rail; truck access to wharf.	No rail; truck access to wharf.	No rail; truck access to wharf.
Remarks	Wharf face irregular; continuity broken.	Wharf face irregular; continuity broken.	Wharf face irregular; continuity broken.

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 10)		
	46 Wharf	47 Wharf	48 Wharf
Location	Ostrov Brevennik, on the Maymaksa.	Ostrov Povrakul'skiy, on the Maymaksa.	Ostrov Povrakul'skiy, on the Maymaksa.
Use	Shipment of lumber.	Shipment of lumber.	Shipment of lumber.
Type and construction	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.
Dimensions (feet):			
Length	370 (face).	245+1,070 (face).	180 (face).
Depth of water (m. l. w.)	20.	20.	20.
Berthing space available	370.	245+1,070.	180.
Width of apron	Open wharf.	Open wharf.	Open wharf.
Rail and road connections	No rail; truck access to wharf.	No rail; truck access to wharf.	No rail; truck access to wharf.

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 10)	
	49 West Wharf	50 East Wharf
Location	Ekonomiya, on the channel, Kuznechikha.	Ekonomiya, on the Kuznechikha.
Use	Handling general cargo, shipment of lumber, coaling wharf.	Handling general cargo, shipment of lumber.
Type and construction	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.
Dimensions (feet):		
Length	1,970 (face).	450+600 (face).
Depth of water (m. l. w.)	23 to 24.	23 to 24.
Berthing space available	1,970.	450+600.
Width of apron	Open wharf.	Open wharf.
Height of deck above low water.	6.	6.
Capacity per square foot	25-ton tanks unloaded over wharf during World War II.	No data.

TABLE VI - 2 (Continued)

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: Figure VI - 10)	
	49 West Wharf	50 East Wharf
Transit sheds:	Five sheds.	None.
Construction	Wooden frame.	.....
Length and width (feet)	2 sheds, 180 by 75; 2 sheds, 160 by 45; 1 shed, 180 by 45.	.....
Number of floors	One (all sheds).	.....
Total floor area (sq. ft.)	49,500.	.....
Mechanical handling facilities	Four portal cranes, two of 6-ton and two of 7.5-ton capacity; two 35-ton derricks; one 8-ton caterpillar crane; one 7.5-ton locomotive crane.	Four 5- to 7-ton traveling steam cranes.
Rail (5'0" gage) and road connections.	Double tracks run full length of wharf under ship's gear; truck access to wharf.	Double tracks run full length of wharf; truck access to wharf.
Water supply	Available from hydrants on wharf.	Available from hydrants on wharf.
Electricity	220-v. current available.	220-v. current available.



FIGURE VI-5. Arkhangel'sk.
The main part of the city, piers, and wharves. 1942.

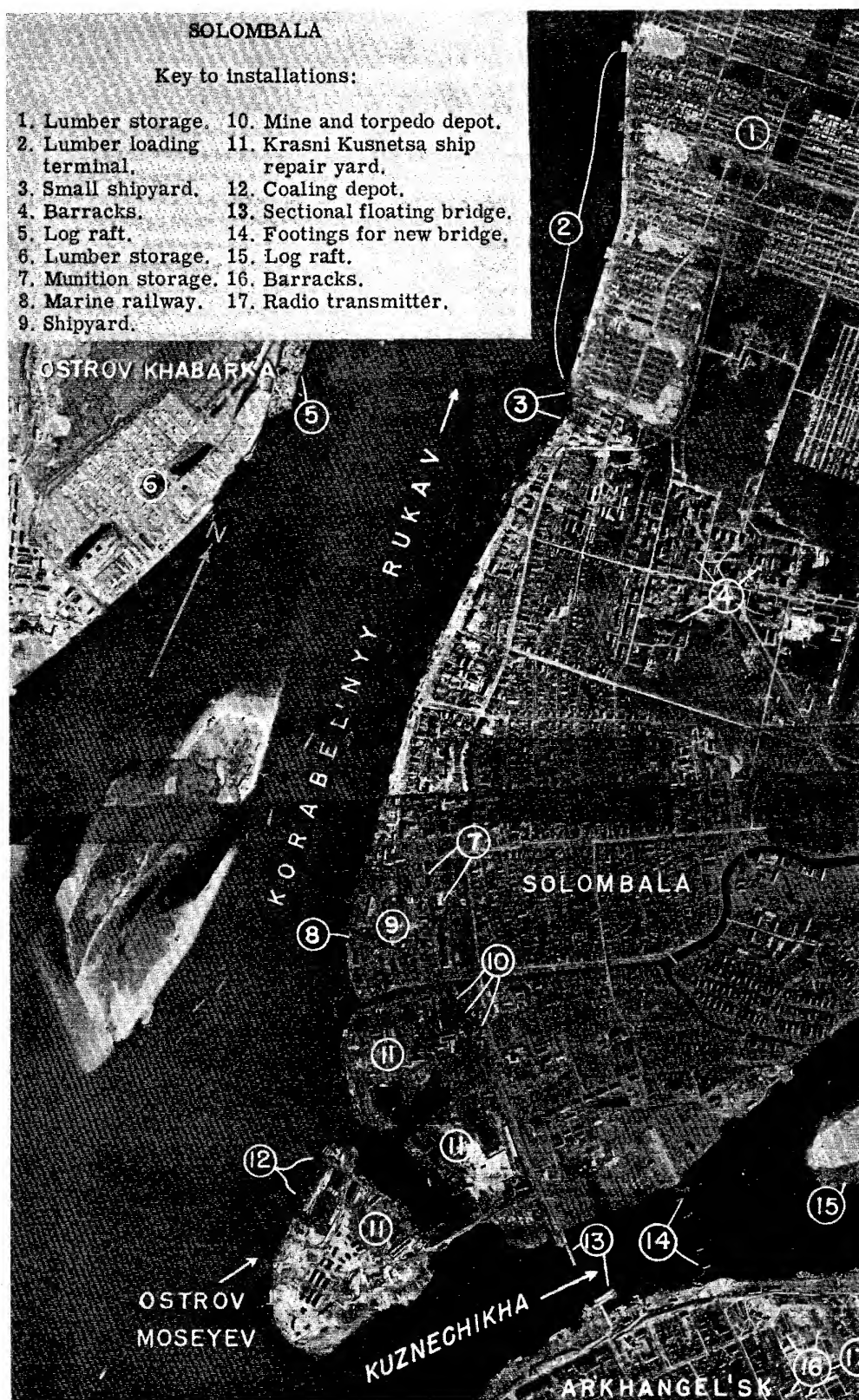


FIGURE VI-6. *Arkhangel'sk.*
Facilities at Solombala and the connected island of Ostrov Moseyev. Portions of Ostrov Khabarka and the city, Arkhangel'sk, are also visible. 1944.

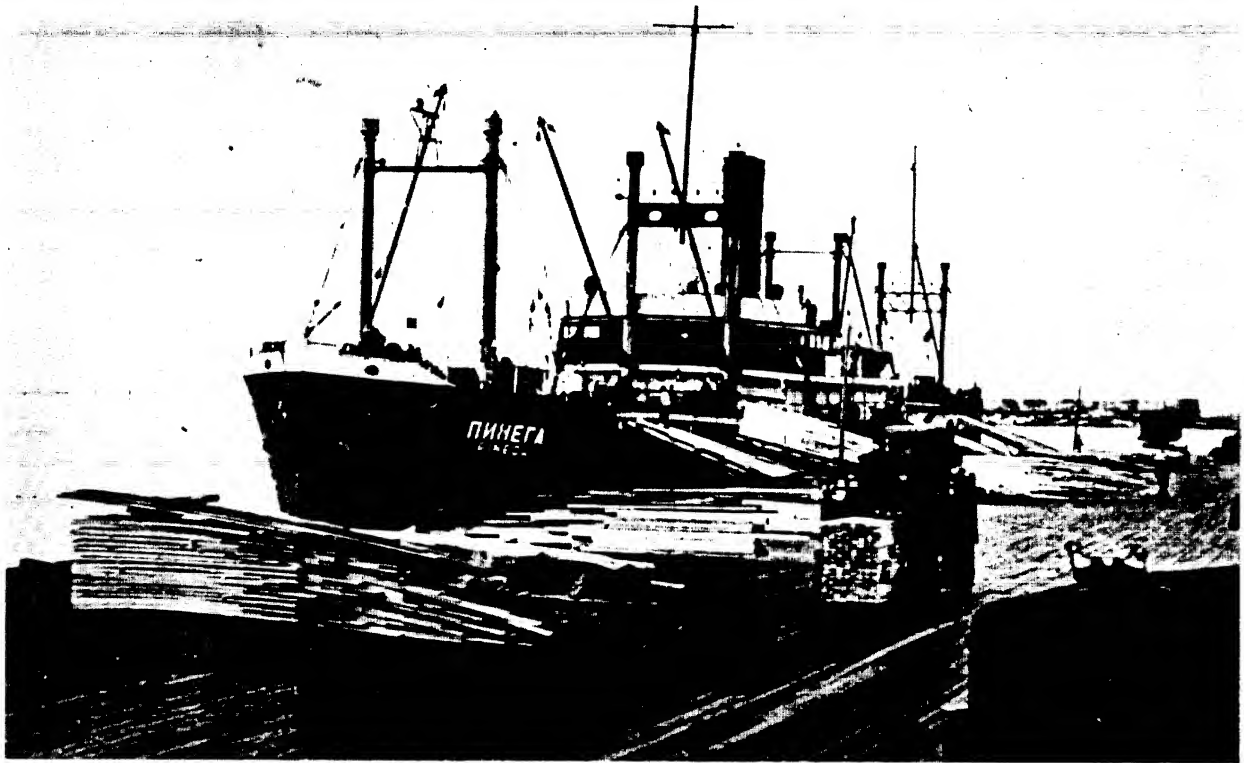


FIGURE VI-7. Arkhangel'sk.

A typical lumber-handling wharf of a lumber mill. Note the rough timber deck, loading ramps, and the American-made Ross lumber carriers. No date.

TABLE VI - 3
SUMMARY OF HOISTING FACILITIES
Port of Arkhangel'sk

Number and type	*Lift capacity	Power used	**Location and reference number on FIGURES VI-9 and VI-10
<i>Tons</i>			
ASHORE:			
10 railway cranes	5 to 7	Steam	Bakaritsa (2).
2 do.	18	do.	
6 tractor cranes	5	Gasoline	
1 traveling crane	2 to 3	Electric	
1 do.	20	do.	Ekonomiya (49).
1 caterpillar crane	8	Gasoline	
1 do.	6	do.	
2 portal cranes	6	Electric	
2 do.	7.5	do.	Ekonomiya (50). Arkhangel'sk city (14).
2 derricks	35	do.	
4 traveling cranes	5 to 7	Steam	
1 fixed crane	25	Hand	
AFLOAT:			
1 floating crane	100	No data	Where required in area.
1 do.	50	do.	
1 do.	35	do.	

* No data on reach.

** Reported location; railway cranes can be used on any wharf with rails, and portable cranes can be shifted to any wharf.

(b) *Mechanical handling facilities.*—Details of all known hoisting facilities, including those listed in the wharf descriptions in TABLE VI-2, are shown in TABLE VI-3. Conveyors and other handling equipment of unknown description are also available at the coaling depots at Ark-

hangel'sk railroad station, Solombala, and Ekonomiya. Omission of item from TABLE VI-2 indicates there are no data.

(c) *Harbor craft*

1. **ICE BREAKERS.**—Three large ice breakers, the "Stalin," the "Lenin," and the "Severny Veter" (ex U.S.S. "North Wind") were available in the Arkhangel'sk district in the winter of 1944-1945. Two 880-horsepower ice-breaking tugs are stationed at the port.

2. **LIGHTERS.**—A large but unknown number of river barges and harbor lighters are available. Barges of steel construction range up to 1,000 tons in capacity and those of wooden construction, up to 600 tons.

3. **FUELING CRAFT.**—Oil-bunkering craft stationed at Arkhangel'sk are listed as follows:

TYPE AND NAME	CAPACITY	MAX. RATE OF DELIVERY
<i>Fuel oil:</i>	<i>Bbls.</i>	<i>Bbls. per hr.</i>
Tanker "BUG"	25,375	500
Lighter No. A103	2,755	360
Lighter No. A105	2,755	360
Lighter No. A107	5,075	No pump
Lighter No. A108	5,075	Do.
<i>Diesel oil:</i>		
Lighter No. AM102	2,755	360
Lighter No. 6818	2,755	360

4. **MISCELLANEOUS CRAFT.**—Two salvage tugs are stationed at the port. No water barges are available. Four vessels, tentatively identified as dredges, were visible in the port in 1944.



FIGURE VI-8. Arkhangel'sk.

Oblique aerial looking northward, showing one of the numerous lumber storage yards and its wharf facilities on the channel, Maymaksa. 1931.

(3) Storage facilities

(a) *Warehouses.*—Covered storage facilities for cargo are concentrated primarily at the three import terminals, Bakaritsa, Arkhangel'sk railroad station, and Ekonomiya, and consist of the following:

LOCATION	NUMBER OF BUILDINGS	TOTAL FLOOR AREA Square feet
Bakaritsa	28	227,650
Arkhangel'sk R. R. station	16	203,150
Ekonomiya	4	36,000
Total	48	466,800

All warehouses are one-story wooden structures and are served by railroad.

Numerous warehouses are reported in Arkhangel'sk city, and at Smol'nyy Buyan on the western side of town more than 30 storage structures of unknown size and capacity are reported.

(b) *Supply dumps.*—Areas suitable for use as supply dumps are located throughout the port.

1) *Bakaritsa.*—Over 10 acres of open storage space accessible from the wharves and served by roads and numerous railroad spurs.

2) *Arkhangel'sk railroad station.*—Considerable fragmented open storage space in the vicinity of the wharf and warehouses. Rail and road service throughout the terminal.

3) *Ekonomiya.*—About 25 acres of open storage space in the vicinity of the wharves and warehouses. Rail and road service throughout the terminal.

4) *Timber wharves.*—Large potential open storage spaces are located adjacent to the various sawmills and timber loading wharves. These areas, however, are ordinarily covered by piles of lumber (FIGURE VI-8).

(4) Capacity and clearance

(a) *Unloading capacity.*—Only the capacities of Bakaritsa and Arkhangel'sk railroad station can be cleared directly to the interior without rehandling over water. During World War II daily capacity reached 11,000 tons for the port.

(b) Facilities for clearing port

1. *RAIL.*—Arkhangel'sk railroad station on the south bank of the Severnaya Dvina, opposite the city, is the terminus of the 5'0" gage line from Vologda. The line is double tracked to within about 80 miles of Arkhangel'sk. This 80-mile section is single track except for a few miles entering the terminus where only the wharves at Bakaritsa and the station have direct-line connections. During the ice-free seasons a railroad car ferry operates between the station and Arkhangel'sk. A spur line runs north from Arkhangel'sk over permanent bridges via Solombala to the facilities at Ekonomiya. During the winter months temporary tracks laid on the ice replace the ferry service. There are car floats, but number and capacities are unknown.

Several railroad sidings and spurs are located at Arkhangel'sk railroad station and Bakaritsa. At Isakogorka, 2.6 miles south of Bakaritsa, are located railroad shops, a large marshalling yard, and the junction of the branch line to Molotovsk.

The capacity of this line for sustained clearance to Vologda and connection with the main USSR system is restricted by the 80-mile single-track stretch. A daily capacity of 5,000 tons has been reported, but this is believed to be a temporary maximum for a few days during the summer. The sustained capacity would be no more than that of a single-track line and the summer capacity would be reduced by the low winter temperatures.

2. ROAD.—There are no all-weather road exits from the Arkhangel'sk port area to the interior.

3. INLAND WATERWAY.—During the ice-free period the Severnaya Dvina is the principal transport route for local commerce. Great quantities of timber are floated down to the Arkhangel'sk sawmills from the forests upstream, and an unknown amount of cargo is carried by a large fleet of barges and river boats. Craft drawing less than 9 feet operate as far as Kotlas, 340 miles upstream. There are no data on the volume of cargo transported upstream.

4. AIRFIELDS.—An undescribed airfield is located at Bakaritsa (Reference No. 16, FIGURE VI-2). Another field was located on an island in the Severnaya Dvina, 15 miles south of Arkhangel'sk. In 1941 this 8,200- by 5,250-foot field had sod runways, but its present status is unknown.

(5) Supplies

(a) *Petroleum*.—Stocks reported on hand in September 1943 were: fuel oil, 22,300 barrels; diesel oil, 8,000 barrels. Storage installations are located principally at Glukovskaya (Arkhangel'sk railroad station). A group of ten tanks of various sizes and capacities is connected by pipe line with a small lighter pier (FIGURE VI-3). A new installation consisting of three 100-foot-diameter tanks is reported under construction just south of the railroad station. All bunkering is done by lighter. (Fueling craft are listed and described under subparagraph (2), (c), 3, preceding.)

(b) *Coal*.—Three coal-bunkering and storage depots are located in the port.

1) *Glukovskaya (Arkhangel'sk railroad station)*.—The coaling depot occupies the western end of the wharf (FIGURE VI-3) and consists of a large stockpile served by rail spurs and a conveyor loading system with grab buckets. Coal on hand in September 1943 was reported to be 7,200 tons.

2) *Ostrov Moseyev*.—The depot provides berthage for two vessels. Coal is handled by four overhead conveyor systems with grab buckets (FIGURE VI-6).

3) *Ekonomiya*.—The coaling depot occupies two berths at the western end of the West Wharf (FIGURE VI-4) and consists of two belt conveyors and a limited stock of coal.

(c) *Water*.—Fresh water is not available at the wharves and there are no water boats in the port. River water is used for boiler purposes but must be treated before drinking.

(d) *Electricity*.—Two small wood-burning thermo-electric plants are reported at Arkhangel'sk city and Solombala. The plants are reported of about 5,000 kw. capacity but to be heavily overloaded and the output subject to considerable variation. Both alternating and direct current are distributed at 110 and 220 volts. Electric current at 220 volts is available at the Bakaritsa and Ekonomiya wharves.

(6) Repair facilities

(a) *Krasnaya Kusnetsa Repair Yard*.—This installation is located at Solombala on the margins of a small inner basin formed by Ostrov Moseyev, Solombala, and a causeway which connects them (FIGURE VI-6), and is the main ship-repair plant at the port of Arkhangel'sk. The yard is a civil establishment directed by a Merchant Service officer, but in recent years has been under naval control.

1. DOCKING FACILITIES.—Dry dock equipment includes a graving dock, a floating dry dock and some marine railways. Dimensions of the graving dock are as follows:

Length	280 ft.
Width of caisson	32 ft.
Depth over sill	12 ft.

The dock is very wide in proportion to length and will accommodate two vessels lying parallel on separate sets of blocks. The entrance gate is on the center line of the dock and vessels must be shifted laterally after entering the dock to a position over either set of blocks. Because of the shallow depth of the dock, the blocks are very low. The use of shores is impracticable and cradles must be constructed.

The 370-foot-long and 70-foot-wide floating dry dock is moored alongside a wharf (Reference No. 24, FIGURE VI-9) in front of the yard. Vessels up to 4,000 tons can be lifted. A hand-operated traveling crane is installed on one side wall of the dock.

The marine railways are located at the head of a slip just west of the graving dock. Details on the capacities and number of cradles are unknown.

2. SHOPS.—Installations include a good boiler shop, pattern shop, and foundry. Iron castings and plate work of good quality are the principal items of production. The machine shop and forge are small and out-of-date and most shop work is of inferior quality. A well-equipped floating workshop is moored at the yard and reportedly handles all small machine work. The boiler shop is new and equipped with two 10-ton traveling gantry cranes. Heavy lifts are handled by two 50-ton floating cranes in the basin, and by at least one steam railway crane in the yard. Electric power of 110 or 220 volts, a.c. and d.c., is available throughout the yard.

(b) *Laya Repair Yard*.—This yard is located at Laya, on Nikol'skiy Rukav about 8 miles west of Arkhangel'sk.

1. DOCKING FACILITIES.—A single graving dock comprises the dry dock equipment at the Laya plant. Dimensions are as follows:

Length	370 ft.
Width of gate	47 ft.
Depth over sill	18 ft.

The dock walls are constructed of wood and the use of cradles rather than shoring is advisable.

2. SHOPS.—The yard has a number of small shops containing such equipment as medium-sized plate-drilling machines, shears, punch, small forge and swage block, an old 8-inch lathe, and a small drilling machine. Work beyond the capacity of these shops is sent to the Krasnaya Kusnetsa yard. A steam crane of 1.5-ton capacity travels on rails along the sides of the dock but cannot plumb the center line. A fitting-out wharf, 200 feet long and 25 feet wide, adjoins the yard.

(c) *Boat yards*.—Two boat building and repair yards equipped with marine railways are located in Solombala north of the Krasnaya Kusnetsa yard (FIGURE VI-6), and there are probably similar plants elsewhere in the port.

(d) *Salvage station.*—A station of the Government salvage agency, EPRON, is located at Solombala.

(7) *Trade of port*

Normally the trade of Arkhangel'sk is almost entirely export, with lumber (80%), chrome, and magnesite comprising the main cargo items. During World War II, the port was a principal receiving point for American and British lend-lease shipments to the USSR.

Trade for the pre-war years 1934-1937 is summarized in TABLE VI-4. The import figures include the trade of Molotovsk. Statistics on domestic commerce are not available.

TABLE VI-4
SUMMARY OF TRADE
Ports of Arkhangel'sk and Molotovsk

Year	Imports*		Exports**	
	Short tons	***Percent	Short tons	***Percent
1934	Negligible	...	1,783,517	9.33
1935	2,146	0.15	2,000,354	10.56
1936	4,798	0.38	2,217,323	14.16
1937	1,323	0.09	2,102,986	14.71

* Arkhangel'sk and Molotovsk.

** Arkhangel'sk only.

*** Percent of total USSR trade through ports.

(8) *Naval establishments*

Arkhangel'sk is the main operating and repair base for the White Sea Flotilla and the rear base of the Northern Fleet. The operating base is located at Solombala and its installations include:

1. Headquarters of the White Sea Flotilla
2. The Novaya Zemlya and Arctic Hydrographic Administration
3. An EPRON (government salvage agency) salvage station
4. A mine and torpedo depot
5. Ordnance stores

The Krasnaya Kusnetsa ship-repair yard at Solombala is located adjacent to the naval base and is presently under naval jurisdiction. There are no wharves for the exclusive use of naval vessels.

B. Murmansk (68°58'N, 33°03'E)

Murmansk (estimated 1945 population, 100,000) is located on Kol'skiy Zaliv, the best ice-free harbor on the Barents Sea (FIGURE VI-1). Since 1928 the port has undergone an extensive program of development. By provision of new port facilities and a railroad to the south, Murmansk was made a leading shipping center and naval base (FIGURES VI-11 and VI-12). During World War II, Murmansk handled a large volume of lend-lease imports and served as an alternative to Arkhangel'sk during the winter when the latter is closed by ice. Exports consist principally of apatite, timber, and fish products. A large fishing fleet is normally based at Murmansk and a large proportion of its port facilities are associated with the fishing industry. The city is the administrative center of the oblast.

The port has more than 17,000 linear feet of wharves and can accommodate some 40 medium- and small-sized cargo vessels alongside; however, only 17 vessel berths, concentrated at two terminals, are normally used for cargo transfer. Nearly every wharf in the port is served by railroad spurs and the cargo terminals have covered storage and some cranes.

Kol'skiy Zaliv is the principal Arctic naval base of the USSR, and Murmansk is administrative headquarters of

the Northern Fleet "Service of the Rear" and the site of important naval installations.

(1) *Harbor*

Murmansk is located on Kol'skiy Zaliv, the largest and best harbor on the Barents Sea coast of USSR. Kol'skiy Zaliv is a deep winding inlet indenting the Murmansk Bereg (Murmansk Coast) for about 34 miles in a southwesterly direction. Murmansk is situated on the upper reach 26 miles from sea. The port installations occupy 3 miles of waterfront on the east shore adjacent to the town (FIGURES VI-13 and VI-16). In the vicinity of the port, the harbor is ½ to 1 mile wide and depths in mid-channel range from 10 to 20 fathoms; but approach to wharves is 26 feet during low water. Two drying shoals lie off the south and central sections of the port, but elsewhere the harbor is clear. Kol'skiy Zaliv is well protected from all winds and seas, and tidal currents are too weak to affect navigation.

(a) *Entrance channel.*—Approach to Murmansk through Kol'skiy Zaliv can be made without difficulty. Through its lower and middle reaches the inlet is virtually clear and free of all dangers. The entrance is almost 2 miles wide and over 100 fathoms deep.

(b) *Anchorage.*—Although a greater part of Kol'skiy Zaliv is unsuited for anchorage because of excessive depths, good berths are available for vessels of any size. Sixty-six numbered anchorage berths are designated throughout the inlet—51 second-class berths and 15 third-class berths. In the summer of 1944, approximately 100 merchant ships and escort vessels were anchored simultaneously in Kol'skiy Zaliv. Good anchorage close to Murmansk is available in the harbor area off Rosta.

(c) *Hydrographic features.*—The mean high water lunital interval at Murmansk is 6 hours 55 minutes. Mean high water springs rise 12 feet; neaps, 9¾ feet. The maximum velocity of tidal currents in Kol'skiy Zaliv off Murmansk is 1.0 knot at flood and 1.7 knots at ebb.

The Barents Sea coast in the vicinity of Murmansk is warmed by a branch of the Gulf Stream; consequently, Kol'skiy Zaliv is virtually ice-free and open to navigation the year around. Although ice breaker assistance may be required for a few days in some years, operations at Murmansk are never disrupted.

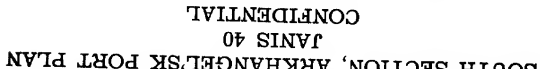
(d) *Local weather.*—The mean annual temperature at Murmansk is 31°F. and the maximum recorded extremes are 91°F. and -39°F. Snow is likely to fall during all months except July, August, and September; average annual precipitation is about 16 inches. Prevailing winds are south through southwest to west. Wind velocities exceed 33 m.p.h. on 36 days per year.

From January to April, a local fog due to condensation is prevalent in Kol'skiy Zaliv. This usually occurs when the temperature is between -5°F. and 5°F. and may continue five or six days. During such times all movement of shipping is halted.

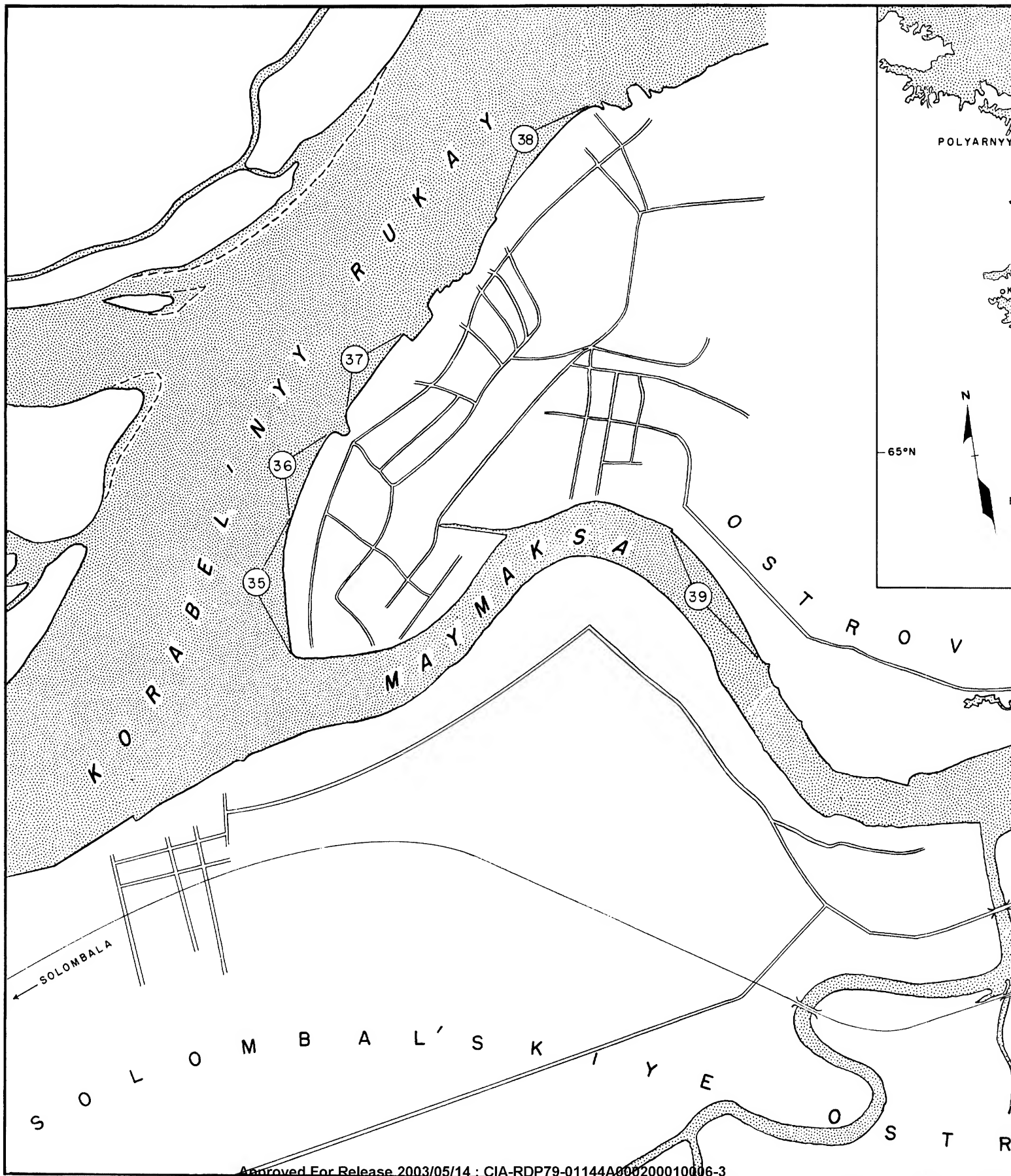
(2) *Terminal facilities*

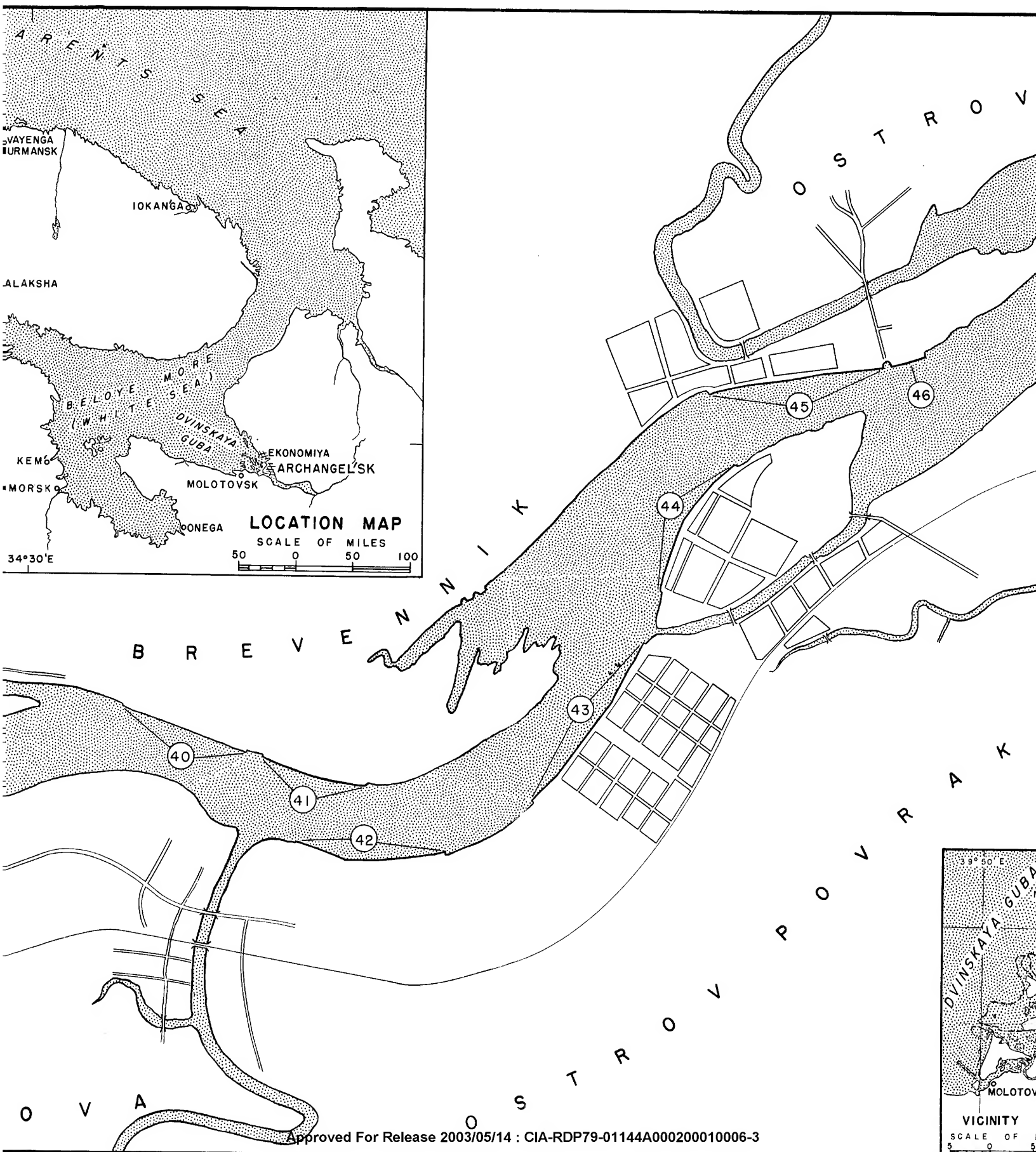
(a) *Piers and wharves.*—The port of Murmansk has a total of about 17,435 linear feet of usable wharves, classified according to alongside depths as follows:

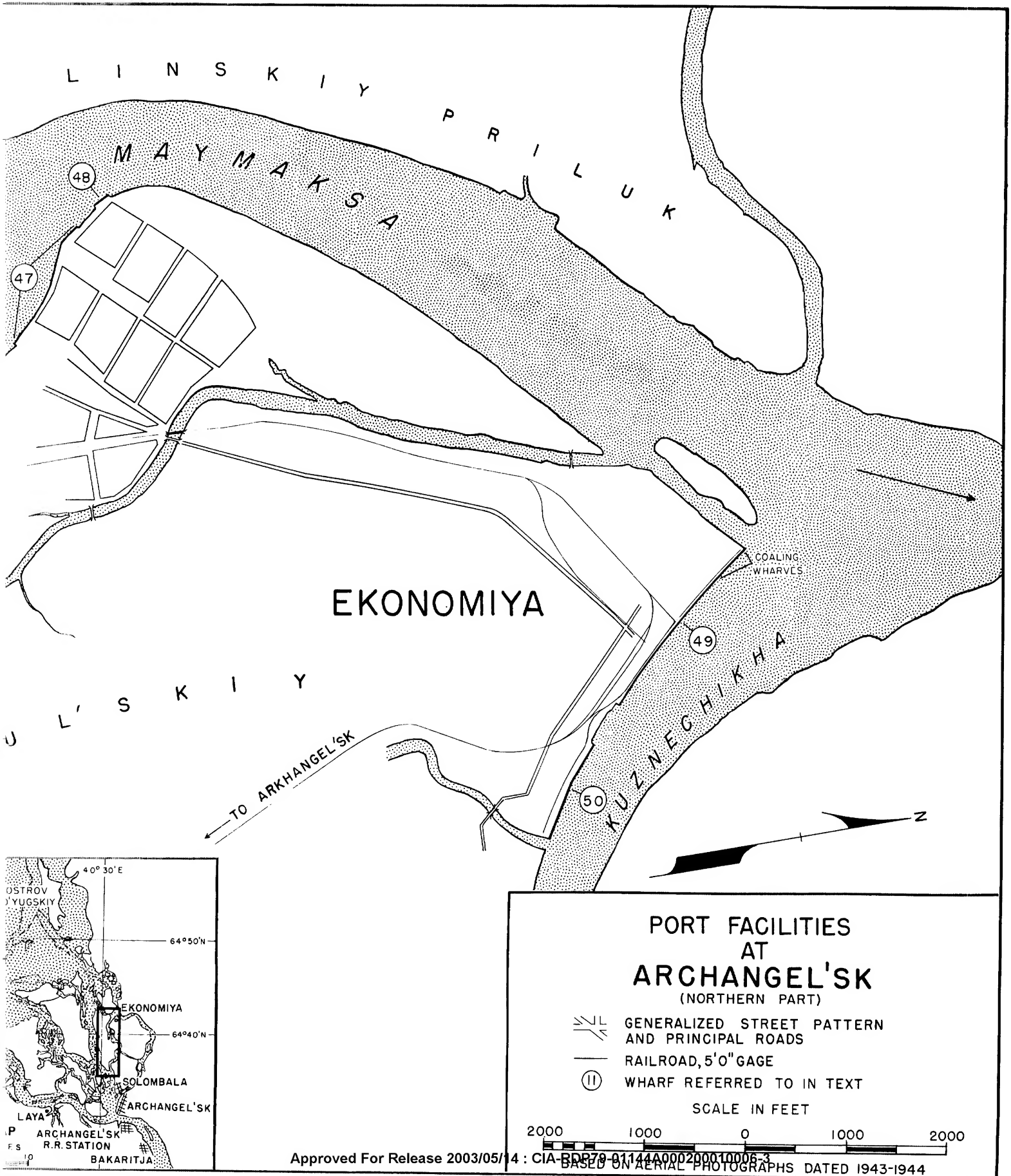
LINEAR FEET OF WHARVES	LOW WATER ALONGSIDE Depths in feet
13,190	18 to 25
2,260	13 to 18
1,245	Less than 13
740	No data
17,435 Total	











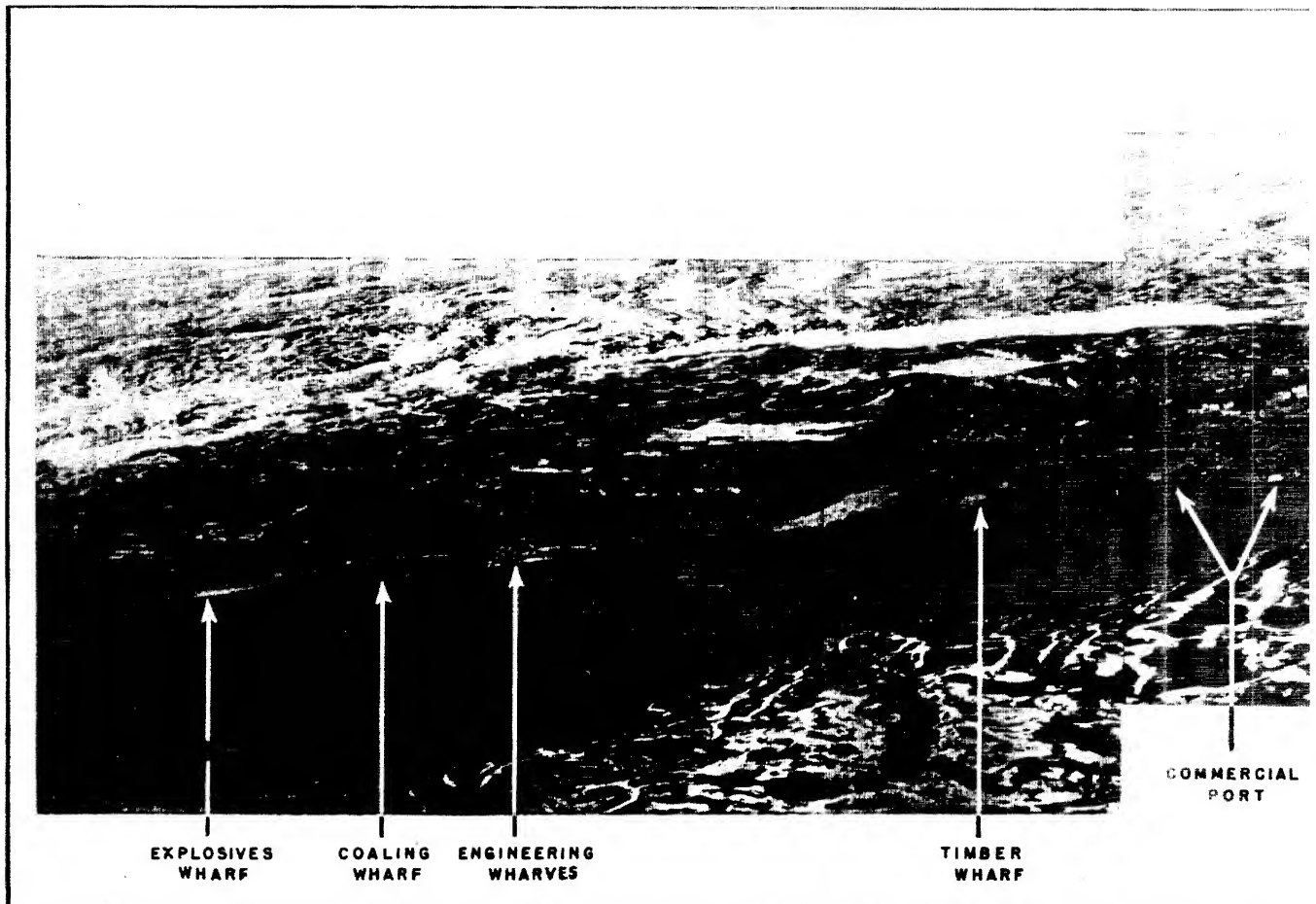
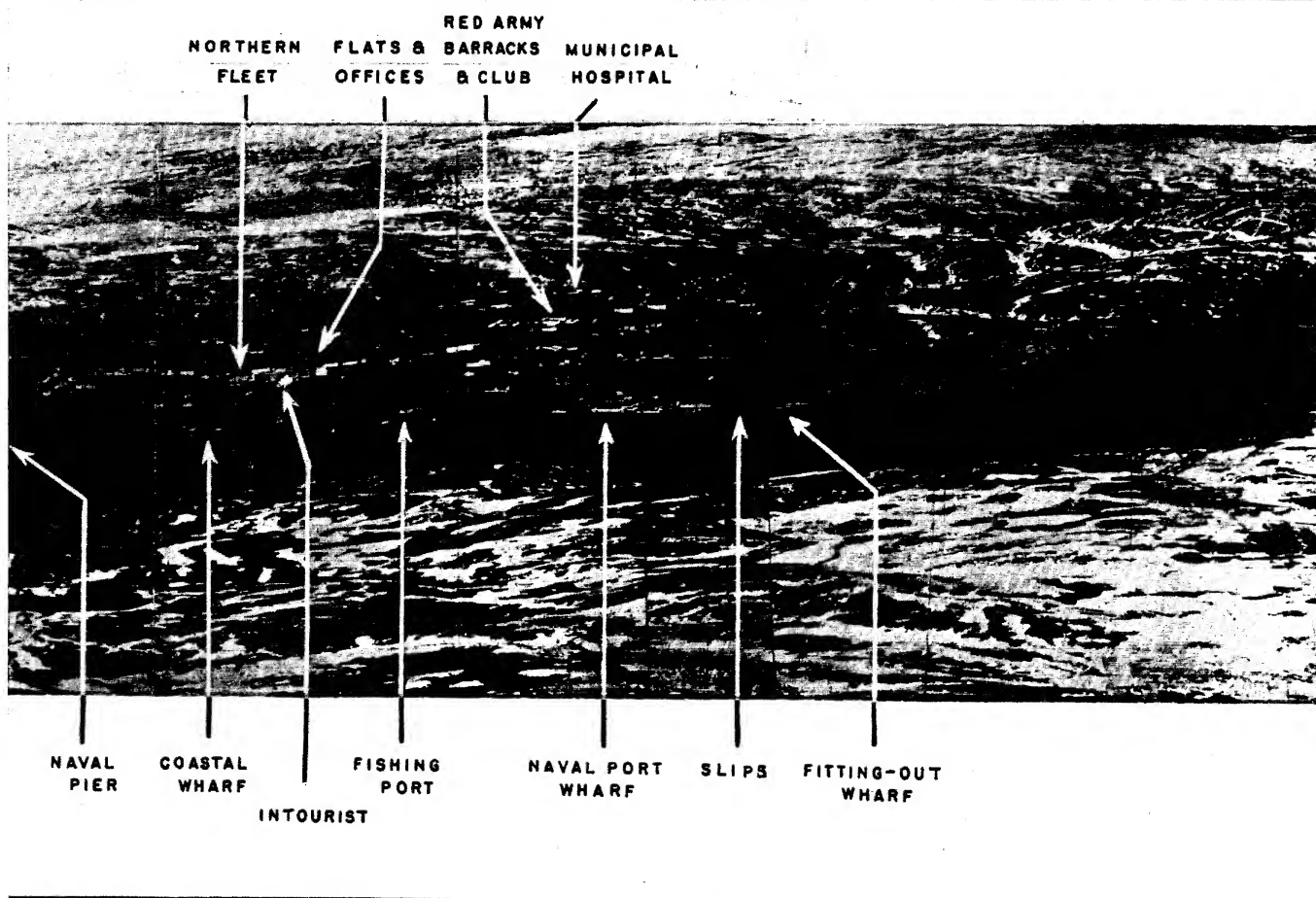


FIGURE VI-1
Panorama looking eastward, showing the c



FIGURE VI-2
Panorama looking over the city and to the westward across Kol'sk
frame buildings which were destroyed during World War II; mu
Port) wharves and the small naval wharf (Reference



1. Murmansk.
ity and its port facilities. Prior to June 1945.



12. Murmansk.
y Zaliv. Most of the vacant area in the foreground was occupied by
ch of the area is believed rebuilt. The Commercial Port (Torgovy
Nos. 10 to 14, Figure VI-16) are right of center. Aug. 1945.

FIGURE VI-13
MURMANSK (AND ROSTA)
JANIS 40
CONFIDENTIAL



FIGURE VI-13. Murmansk.
An uncontrolled mosaic of the city on the left, Rosta on the right. June 1944.

Normally Murmansk is used by smaller cargo vessels such as C1-A and C1-M types. During World War II, however, Liberty ships (loaded draft, 28 feet) used the port in great numbers but ordinarily were compelled to lighten before moving alongside. At several berths vessels of excessive draft were able to work cargo by breasting off the wharf a short distance. In such instances depths up to 27 and 29 feet were available to vessels breasting off about 16 feet.

Landing facilities at Murmansk are composed primarily of marginal wharves of wooden construction. Only 17 vessel berths, or about 50% of the total wharfage, normally are used for cargo transfer operations. The remainder of facilities either are unable to accommodate oceangoing vessels, are structurally unsuited for general cargo handling, or are assigned to some specialized use. Regardless of their use, all of the principal wharves are served by railroad spurs, and the cargo terminals have covered storage facilities and wharf cranes.

The port is divided into five functional sections or sub-ports (FIGURE VI-16):

Rosta.—This section, located at the north end of the port, is made up largely of service facilities and includes such installations as the Rosta Dockyard, coal- and oil-bunkering wharves, an explosives wharf, and a military-supplies depot.

Timber Port.—This section consists of a large mole quayed on one side for ship berthage, and specializes in

the export of lumber and the import of general cargo. Cranage, large open storage space, and good rail-clearance facilities are available.

Commercial Port.—This is the principal terminal for overseas shipping and consists of a large mole with two projecting piers. Several vessels can be handled simultaneously and the terminal is well equipped with wharf cranes, transit sheds, and railroad spurs. Although heavily damaged by bombing during World War II, facilities in the Commercial Port mostly have been repaired and the terminal restored to normal operating capacity (FIGURE VI-16).

Fishing Port.—An extensive section of the port is devoted to the fishing industry and embraces a large amount of small craft wharfage, bunkering installations, several sheds and warehouses, and a cannery.

Trawler Base.—Located at the south end of the port, this section consists of a large dockyard which before the war served as a maintenance base for a large fleet of trawlers. Installations include several shops, building slips, and a marine railway. In recent years the dockyard has been under naval control and used largely by naval craft.

Port facilities on the west shore of Kol'skiy Zaliv at Murmansk are limited to a few scattered fishing piers, a boat-yard, and at Abram Pakhta, a large floating dry dock.

Dimensions and constructional details of the principal wharves at Murmansk are shown in TABLE VI-5.



FIGURE VI-14. Murmansk.
Looking west along the north side of the wharf (Reference No. 10) in the Commercial Port. About 1944.

TABLE VI - 5
PIERS AND WHARVES
Port of Murmansk

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 16)		
	1 Rosta Dockyard Wharf	2 Rosta Stores Wharf	3 Rosta Oil Pier
Location	Rosta dockyard.	Rosta.	Rosta.
Use	Ship outfitting and repair.	Handling supplies.	Handling petroleum products.
Type and construction	Wooden marginal wharf, 50 ft. wide. (S 450 ft. of W side consists of 20-ft.-wide deck with 5 shore connections.)	Wooden offshore wharf with two 15-ft.-wide approaches, 200 and 160 ft. long.	Wooden T-head pier, with pierhead 30 ft. wide and approach 600 ft. long and 25 ft. wide. Berthage at face only.
Dimensions (feet):			
Length	N Side 740 W Side 450+240	175 (face).	510 (face).
Depth of water (m. l. w.)	20 25 (est.) 25 (est.)	No data.	22.
Berthing space available	740 450 240	175.	510.
Width of apron	50 20 50	25 and 35.	30.
Transit sheds:	None.	One shed.	None.
Length and width (feet)	.....	70 by 20.	.....
Number of floors	.....	One.	.....
Total floor area (sq. ft.)	.....	1,400.	.....
Mechanical handling facilities	Tractor cranes available.	No data.	Pipe lines laid on pier.
Rail (5'0" gage) and road connections	Tracks on upland adjacent to wharf; truck access to N side of wharf.	Tracks 500 ft. to rear of wharf. Truck access to wharf.	Tracks and roadway on upland at rear of pier.
Water supply	Available on wharf.	No data.	Available on wharf.
Electricity	Three portable 50-ampere generators supply 220-v. direct current.	do.	No data.
Remarks	.....	Five sheds on upland adjacent to wharf; average size 100 by 25 ft.	.....
DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 16)		
	4 Mine and Torpedo Wharf	5 Explosives Wharf (Berth 15)	6 Coaling Wharf
Location	Rosta.	Rosta.	Rosta.
Use	Loading munitions.	Loading apatite and, occasionally, discharge of explosives.	Coal bunkering.
Type and construction	Wooden offshore wharf, with 3 approaches each 25 ft. wide and 300 ft. long.	Wooden marginal wharf.	Wooden marginal wharf.
Dimensions (feet):			
Length	310 (face).	400 (face).	380+790 (face).
Depth of water (m. l. w.)	25 (approx.).	23 (27 at 16 ft. off wharf face).	20 (est.).
Berthing space available	310.	400.	380+790.
Width of apron	35 (width of wharf face).	80.	Open wharf.
Transit sheds:	One shed (on upland).	One shed.	None.
Length and width (feet)	160 by 60.	330 by 45.	.....
Number of floors	One.	One.	.....
Total floor area (sq. ft.)	9,600.	14,850.	.....
Mechanical handling facilities	No data.	Tractor cranes available.	Several small portable electric conveyors; traveling crane and tractor cranes available.
Rail (5'0" gage) and road connections.	Tracks and roadway pass to rear of wharf. Industrial R.R. laid on wharf.	Five sidings at rear of shed; truck access to wharf.	Four sidings to rear of wharf; truck access to wharf.
Water supply	No data.	None.	None.
Electricity	Wharf unlighted.	do.	Do.
Remarks	.....	Small T-head pier with 140-ft. face adjacent on S.	.....

TABLE VI - 5 (Continued)

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 16)		
	7 North Engineering Wharf	8 South Engineering Wharf	9 Timber Wharf (Berth Nos. 12, 13, and 14)
Location	Between Rosta and Murmansk.	Between Rosta and Murmansk.	Timber Port, Murmansk.
Use	Mooring and service wharf for harbor authorities.	Mooring and service wharf for harbor authorities.	Shipment of timber, receipt of general cargo.
Type and construction	Wooden marginal wharf.	Wooden marginal wharf.	Mole of solid fill with walls of concrete block. Berthage on SW side only.
Dimensions (feet):			
Length	175 (face).	390 (face).	1,150 (face).
Depth of water (m. l. w.)	No data.	No data.	20 to 21 (25 to 26, at 16 ft. off).
Berthing space available	175.	390.	1,150.
Width of apron	Open wharf.	40 to 70.	Open wharf.
Capacity per square foot	No data.	No data.	Unlimited.
Mechanical handling facilities	do.	do.	Five 3- to 6-ton traveling cranes; locomotive and tractor cranes available.
Rail (5'0" gage) and road connections.	Tracks and roadway in rear of wharf.	Tracks and roadway in rear of wharf.	Double tracks along string-piece under ship's gear; 4 additional sidings in middle of mole. Truck access to wharf.
Water supply	No data.	No data.	Available.
Electricity	do.	do.	None.
Remarks	Small craft only.	Small craft only.	Innermost berth, No. 14, damaged by bombing. A large amount of cargo can be stored on mole adjacent to berths. An oil pipe line is reported laid to wharf.

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 16)		
	10 Pier 2, NE Side (Berth Nos. 9, 10, and 11)	11 Pier 2, NW Side (Berth No. 8)	12 Pier 2, SW Side (Berth Nos. 6 and 7)
Location	Commercial Port, Murmansk.	Commercial Port, Murmansk.	Commercial Port, Murmansk.
Use	General cargo in overseas trade.	Coal bunkering and general cargo.	General cargo in overseas trade.
Type and construction	Solid-fill mole with marginal wharves of timber piling, wooden deck.	Solid-fill mole with marginal wharves of timber piling, wooden deck.	Solid-fill mole with marginal wharves of timber piling, wooden deck.
Dimensions (feet):			
Length	1,450 (face).	720 (face).	930 (face).
Depth of water (m. l. w.)	20.5 to 23 (23.5 to 29 at 16 ft. off).	20.	20 (25 to 27 at 16 ft. off).
Berthing space available	1,150 (including Berth No. 9).	350.	900.
Width of apron	35 at shed.	Open wharf.	90 at shed.
Capacity per square foot (pounds)	400.	400.	400.
Transit sheds:			
Type of construction	One shed (See "Remarks").	None.	One shed (See "Remarks").
Length and width (feet)	Masonry.	.....	Wood frame.
Number of floors	500 by 100.	.....	300 by 50.
Total floor area (sq. ft.)	Two.	.....	One.
Mechanical handling facilities	100,000.	.....	15,000.
	One 45-ton, two 35-ton, and one 8-ton traveling gantry cranes; locomotive and tractor cranes available.	One stationary belt conveyor for handling coal or ore.	Locomotive and tractor cranes available.
Rail (5'0" gage) and road connections.	Double track on apron under ship's gear; other sidings in rear of shed. Truck access to wharf.	Several R.R. spurs terminate at rear of wharf. Truck access to wharf.	Double track on apron under ship's gear; other sidings in rear of shed. Truck access to wharf.
Water supply	None.	None.	Available on wharf.
Remarks	Innermost berth, No. 9, damaged by bombing and not usable as of June 1944. Approach to this wharf difficult because of narrow fairway. Six warehouses located in center of pier serve all wharves.	N half of wharf demolished and S half damaged by bombing; berth unusable as of June 1944. Area at rear of wharf normally used for coal storage.	Six warehouses located in center of pier serve all wharves; additional structures under construction.

TABLE VI - 5 (Continued)

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 16)		
	13 Pier 1 (Berth Nos. 1, 2, 3, 4, and 5)	14 Naval Pier	15 Trawler Repair Wharf
Location	Commercial Port, Murmansk.	Commercial Port, Murmansk.	Fishing Port, Murmansk.
Use	General cargo in overseas trade.	Mooring for small naval craft.	Outfitting and repair of fishing craft.
Type and construction	Solid-fill mole with marginal wharves of timber piling, wooden deck.	Marginal wharf of timber piling, wooden deck.	Marginal wharf of timber piling, wooden deck.
Dimensions (feet):	Face N Side S Side		
Length	475 1,000 360+570	300 (face).	325+120 (face).
Depth of water (m. l. w.)	20 19 18 to 21.5	16.	13.5.
Berthing space available	330 1,000 360+570	300.	325+120.
Width of apron	50 Open Open	Open wharf.	100.
Capacity per square foot.	400 400 400	No data.	No data.
Transit sheds:	One shed.	None.	None.
Construction	Wooden.	.....	.....
Length and width (feet)	160 by 135.	.....	.....
Number of floors	One.	.....	.....
Total floor area (sq. ft.)	21,600.	.....	.....
Mechanical handling facilities	Locomotive and tractor cranes available.	Tractor cranes available.	None.
Rail (5'0" gage) and road connections.	Double tracks on S apron; single track on N apron; four tracks in center of pier. Truck access to pier and aprons.	Tracks adjacent on Commercial Mole; truck access to wharf.	No rail; truck access to wharf.
Water supply	Available on N side of pier only.	None.	No data.
Remarks	21.5- to 27-ft. depths, 16 ft. off wharf.	.....	Machine shops on upland largely destroyed by bombing.

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 16)		
	16 Coast Wharf	17 Fish Wharf	18 Fish Mole
Location	Fishing Port, Murmansk.	Fishing Port, Murmansk	Fishing Port, Murmansk.
Use	General cargo in coastal and overseas trades.	Discharge of fish from small craft.	Discharge of fish from large fish-craft; coal and oil bunkering.
Type and construction	Marginal wharf of timber piling, wooden deck.	Marginal wharf of timber piling, wooden deck.	Marginal wharf of timber piling, wooden deck.
Dimensions (feet):			Face N Side S Side
Length	650 (face).	225+900+120 (face).	430+285 400 1,300
Depth of water (m. l. w.)	19 (22.5 at 16 ft. off).	9 to 12.	13 13 21.5
Berthing space available	650.	225+900+120.	430+285 400 1,260
Width of apron	Open wharf.	15 (through 900-ft. section).	Open Open Partly open
Capacity per square foot.	400.	400.	400 400 400
Mechanical handling facilities	Tractor cranes available.	None.	Locomotive and tractor cranes available.
Rail (5'0" gage) and road connections.	R.R. spur terminates at rear of wharf; truck access to wharf.	R.R. sidings serve fish cannery adjacent to wharf; truck access to wharf.	Double or single tracks run length of apron on S side; two spurs in center of mole. Truck access to wharves.
Water supply	None.	No data.	Available on S side.
Remarks	Area adjacent to wharf seriously damaged by bombing.	Fish sheds and cannery occupy upland adjacent to wharf.	23.5-ft. depth, 16 ft. off S side of mole. Four-story stuccoed masonry warehouse measuring 330 by 75 ft. located on S side of mole. Bunkering berth is at inner end of S wharf and installations include coal stockpiles and 2 oil tanks.

TABLE VI - 5 (Continued)

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 16)	
	19 Fitting-Out Wharf	20 Fitting-Out Pier
Location	Naval Port, Murmansk.	Naval Port, Murmansk.
Use	Repair and fitting-out wharf for adjacent dockyard.	Repair and fitting-out wharf for adjacent dockyard.
Type and construction.	Marginal wharf of timber piling, wooden deck.	T-head pier of timber piling, wooden deck, 20-ft.-wide approach.
Dimensions (feet):		
Length	1,650 (face).	400 by 45 (pierhead).
Depth of water (m. l. w.)	22.	13 (est.).
Berthing space available	1,650.	400.
Width of apron	Partially open.	Open wharf.
Capacity per square foot. (pounds)	400.	400.
Mechanical handling facilities	Locomotive and tractor cranes available.	None.
Rail (5'0" gage) and road connections.	Tracks on apron; truck access to wharf.	Tracks on upland to rear of pier; truck access to wharf.
Water supply	Available on wharf.	No data.
Remarks	Greater depths a few feet off wharf. Wharf reported in dilapidated condition.	Berths for small craft at inner side of pierhead.

TABLE VI - 6
SUMMARY OF HOISTING FACILITIES
Port of Murmansk

Number and type*	Capacity		Location and Reference number on FIGURE VI-16
	Lift	Reach	
<i>Tons</i> <i>Feet</i>			
ASHORE:			
1 traveling gantry crane	45	No data	Pier 2, NE side (10)
2 do.	35	do.	
1 do.	8	do.	
2 do.	6	do.	
3 do.	3	do.	Timber Wharf (9)
1 traveling crane	No data	do.	
1 railway crane**	45	do.	Coaling Wharf (6)
2 railway cranes**	15	do.	
13 do.**	6 to 7.5	do.	Any wharf equipped with railway tracks.
4 do.**	Under 15	do.	
4 tractor cranes	6 to 7.5	do.	
7 do.	Up to 15	do.	
1 truck crane	2	do.	
AFLOAT:			
1 floating crane	{ 150 at 99 at 25 at 18 at	Least	Any wharf as required.
		60	
		130	
		144	
1 do.	50	No data	

* No data on type of power used.

** Railway cranes are unable to plumb ships' holds.

(b) *Mechanical handling facilities.*—Details of the various hoisting facilities known available at Murmansk

are shown in TABLE VI-6. Other equipment on hand in 1944 included seventy 3½-ton motor trucks, eight 2-ton electric trucks, and ten diesel tractors.

(c) *Harbor craft.*—About 18 tugs and 40 lighters were available in 1942. Other equipment includes two unpowered water barges of 80- and 100-ton capacity, two self-propelled oil-bunkering craft of 1,400- and 700-ton capacity, and one unpowered oil barge of 300-ton capacity. An unknown number of oil storage barges are reported located on Kol'skiy Zaliv.

(3) *Storage facilities*

(a) *Warehouses.*—Covered storage facilities were heavily damaged during World War II. Subsequent reconstruction of undetermined extent has been accomplished, particularly in the Commercial Port section. Data on transit sheds and warehouses, based largely on interpretation of aerial photographs taken in September 1944, are shown in TABLE VI-7.

(b) *Supply dumps.*—Ample space for open storage is available throughout the port area and town. The following selected sites are all served by railroad sidings (Reference is to FIGURE VI-16):

LOCATION	REFERENCE	SIZE OF AREA
Adjacent to Explosives Wharf	5	8 acres
Adjacent to Coaling Wharf	6	8 acres
On Timber Wharf	9	9 acres
On Pier No. 1	13	6 acres
On Pier No. 2	10-12	5 acres

TABLE VI - 7
COVERED STORAGE FACILITIES IN PORT AREA
Port of Murmansk

Name of wharf served	Reference on FIGURE VI - 16	Type of facility	No. of buildings	Construction	No. of floors	Dimensions	Floor area	Remarks
						Feet	Square feet	
Rosta Stores Wharf.....	2	Transit shed	1	.....	1	70 by 20	1,400	Located on wharf.
		Warehouse	3	.....	1	90 by 35		
		do.	1	.....	1	130 by 30	16,650	Located on upland.
		do.	1	.....	1	165 by 20		
Mine and Torpedo Wharf..	4	do.	1	.....	1	160 by 60	9,600	Located on upland. Industrial tracks to wharf.
Explosives Wharf.....	5	Transit shed	1	.....	1	330 by 45	14,850	80 ft. from stringpiece. Served by R.R. sidings.
Pier 2, NE side.....	10	do.	1	Masonry	2	500 by 100	100,000	35 ft. from stringpiece. Served by R.R. sidings.
Pier 2, all wharves.....	10, 11, & 12	do.	1	Brick with steel frame.	1	650 by 80	52,000	Structure consists of 6 sections, all served by R.R. sidings. Built during 1944-45. Two additional sheds under construction, 1945.
Pier 2, SW side.....	12	do.	1	Wooden frame	1	300 by 50	15,000	90 ft. from stringpiece. Served by R.R. sidings.
Pier 1, N side and face.....	13	do.	1	Wooden frame	1	160 by 135	21,600	80 ft. from stringpiece. Served by R.R. sidings.
Fish Mole, S side.....	18	do.	1	Stuccoed masonry	4	330 by 75	99,000	45 ft. from stringpiece. Served by R.R. sidings.

(4) Capacity and clearance

(a) *Unloading capacity.*—Actual records of performance in 1944 averaged about 10,000 short tons per day. The maximum rate of clearance from the port during 1942-1943 was 3,700 short tons per day with an average of 2,250 tons per day over a 100-day period.

(b) Facilities for clearing port

1. *RAIL.*—Murmansk is the northern terminus of a single-track (5'0" gage) railroad from Leningrad via Kandalaksha. A branch line runs northeastward from Murmansk about 15 miles to Vayenga. Most of the wharves and port area are served by spurs and sidings.

2. *ROAD.*—A cobblestone road runs northward from Murmansk to Vayenga, and southward to Kola where connection is made with other roads leading farther south. A road runs to Pechenga from Mys Mishukov, a point on the west side of Kol'skiy Zaliv opposite Rosta.

(5) Supplies

(a) *Petroleum.*—Total petroleum storage capacity in Kol'skiy Zaliv was reported to be at least 40,000 tons in November 1944, and a large part of the facilities was located at Murmansk. The largest storage installation in the port is located between Murmansk town and Rosta and consists of several large underground tanks of unknown layout and capacity. Other facilities include a group of about six tanks located just east of the dockyard at the Trawler Base, two tanks near the Fish Mole, and two tanks near the Timber Wharf. The principal petroleum discharge and bunkering wharf is the Oil Pier at Rosta; depths alongside range from 22 feet at low water to 39 feet at high water, and a large tanker can be accommodated. Diesel oil is also stored at the Rosta installation and in 1944 a stock of about 10,000 barrels was maintained. Bunkering craft stationed in the port include a 300-ton unpowered barge, a pumping tug, and two harbor tankers, the "Jeliabov" and the "Ukogir". The "Jeliabov" has a capacity of 1,400 tons of fuel oil and can discharge at a rate of 200 tons an hour through two hoses on either

side. The "Ukogir" carries 500 tons of fuel oil and 200 tons of diesel oil and can discharge at the rate of 70 tons an hour.

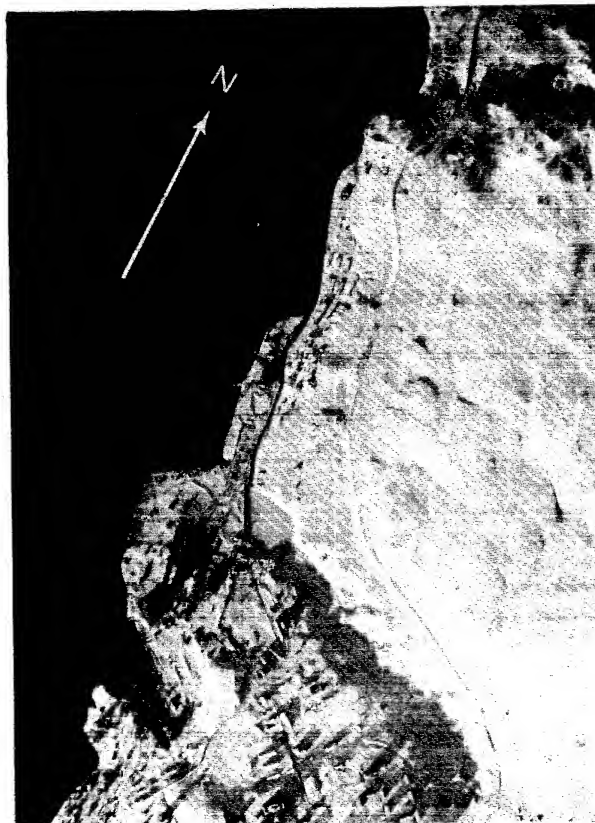
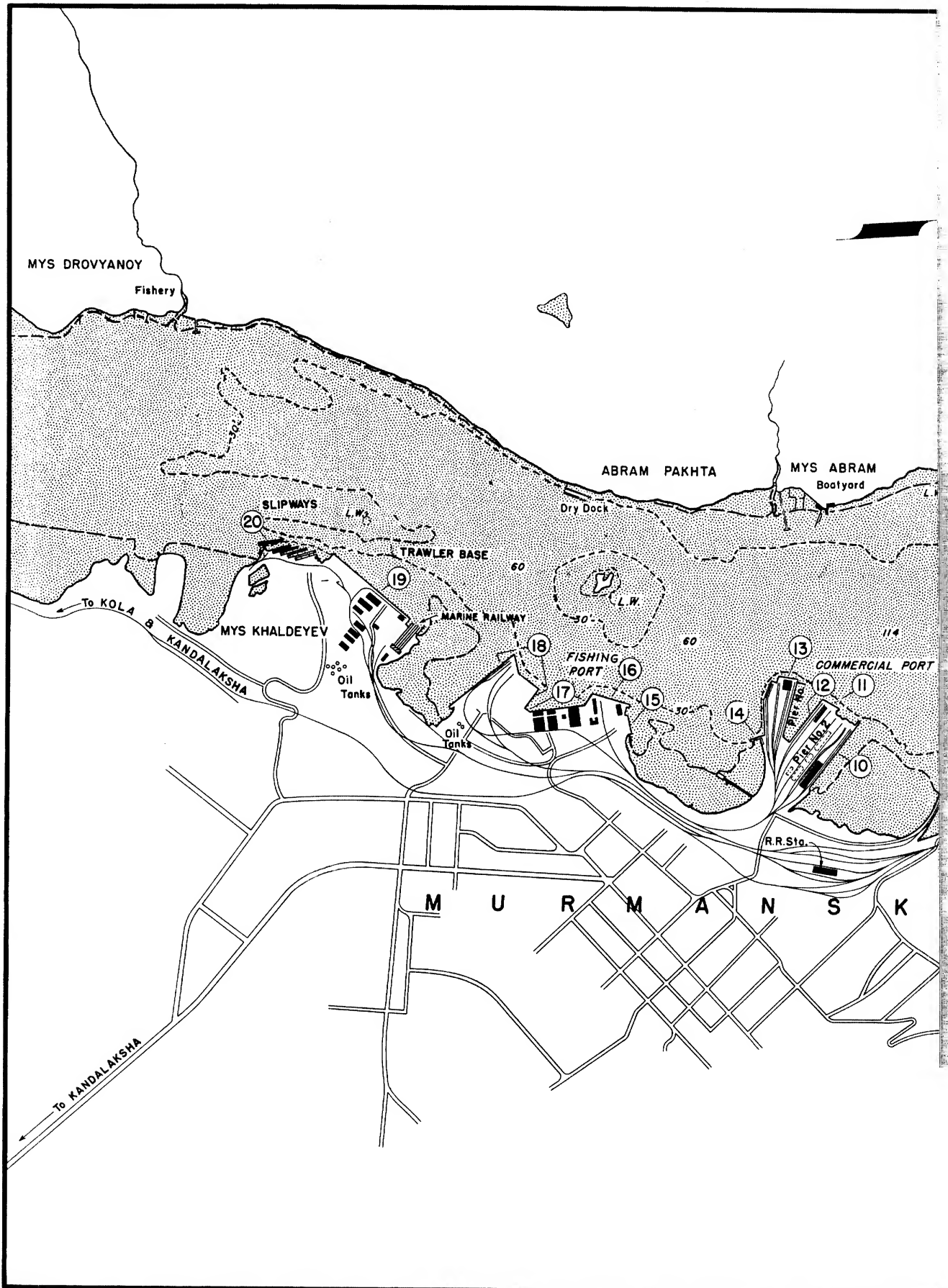


FIGURE VI-15. Murmansk.
Naval facilities at Rosta. Feb. 1944.



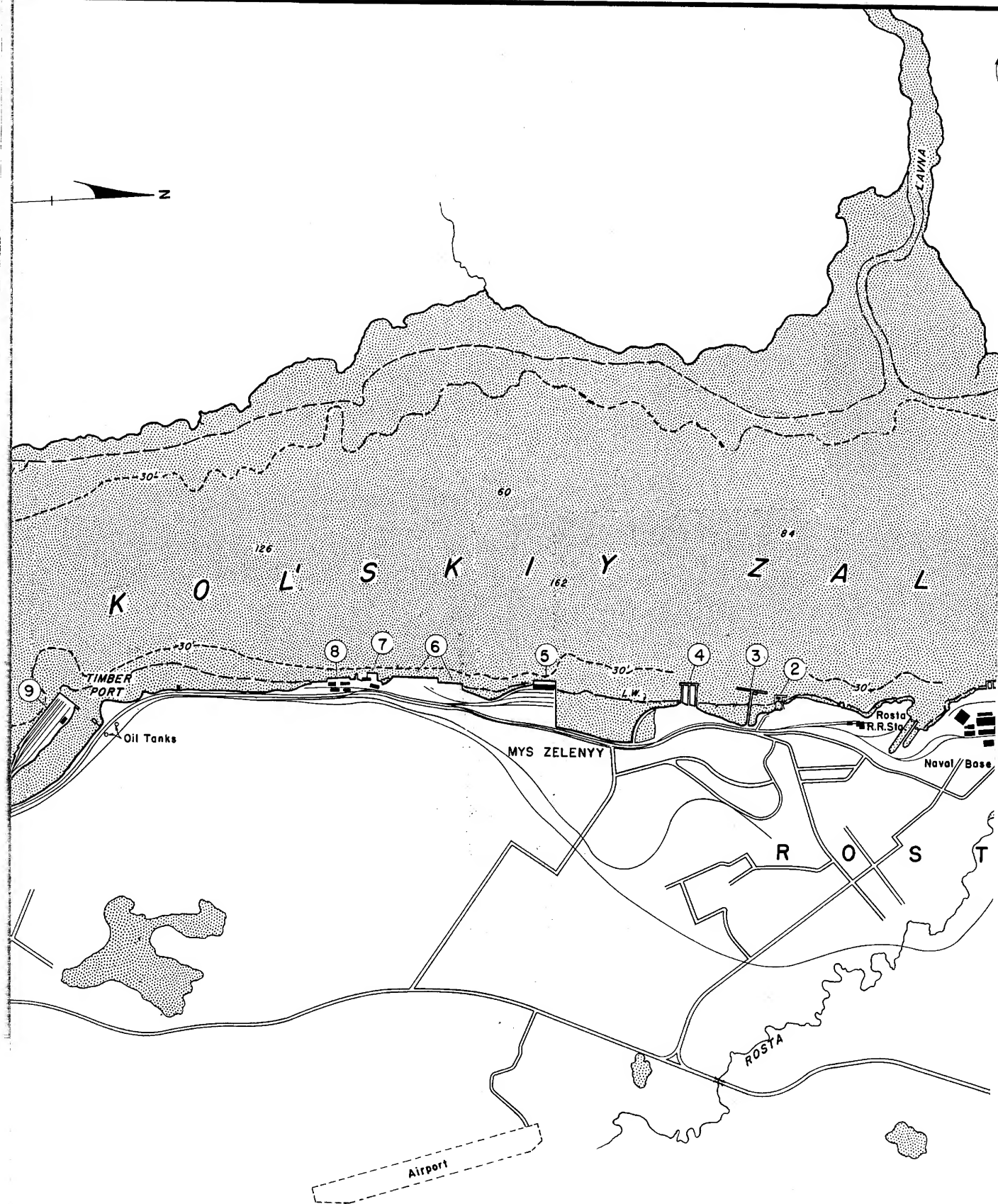
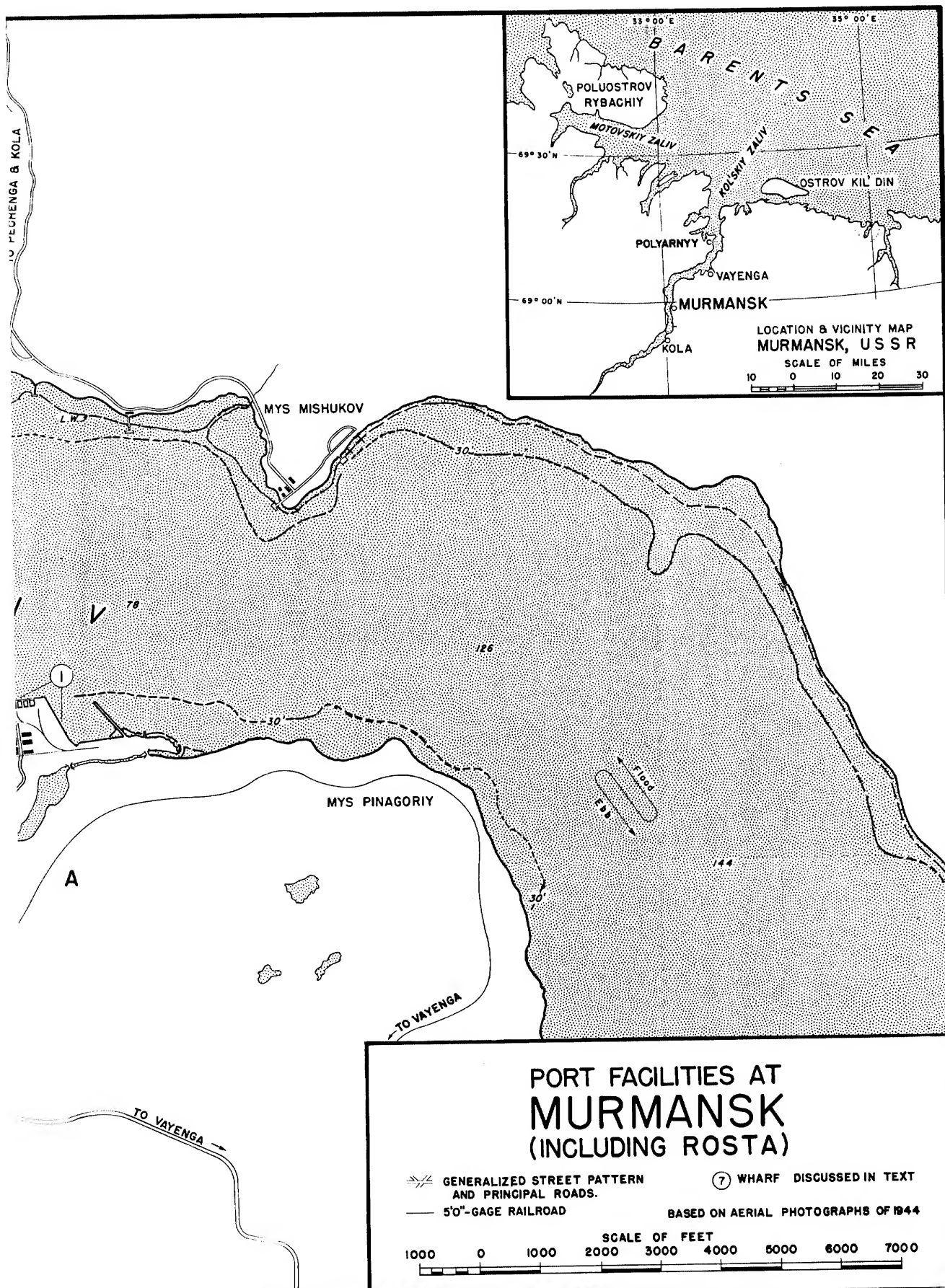


FIGURE VI-16
MURMANSK PORT PLAN
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(b) *Coal*.—About 50,000 tons of coal were stocked at Murmansk in 1942. Bunkering and storage are centered largely at the Coaling Wharf between Rosta and Murmansk. Coal is handled by traveling crane and bucket, or by conveyor, and can be supplied at the rate of 200 tons per day. Small stocks are also maintained at the outer end of Pier 2 and on the Fish Mole.

(c) *Water*.—The water supply is plentiful and is satisfactory for boiler use, but it should be boiled or chlorinated before drinking. Water is piped onto several of the wharves and can be supplied to vessels in the stream by two unpowered water barges of 80- and 100-ton capacity.

(d) *Electricity*.—None of the wharves at Murmansk are equipped with electricity except those at Rosta Dockyard. The regular power supply of the dockyard consists of alternating current, 3 phase, 50 cycles, and probably at 110 and 220 volts. An auxiliary supply is produced by three 220-volt, 50-ampere portable generators.

(6) Repair facilities

(a) *Marine repair plants*.—*Rosta Naval Dockyard* is a major repair base for the Northern Fleet and the only yard in Kol'skiy Zaliv capable of undertaking heavy repairs to large vessels (FIGURE VI-15). In addition to its two graving docks, the yard has shops completely equipped for all types of work.

Murman - Riba Trawler Base was heavily damaged during the war and its present status is not known. It was used as a repair base for naval patrol craft, and besides several marine railways had many well-equipped shops.

Other repair plants in the Murmansk area include a boat building and repair yard at Mys Abram, several machine shops in the Commercial Port and Fishing Port areas, and a machine shop and a floating repair shop at Mys Drovyanoy on the west shore of Kol'skiy Zaliv.

(b) *Dry docks*.—The following equipment is located at Murmansk.

1. *ROSTA*.—Two graving docks are located at the Rosta naval dockyard (FIGURE VI-15). Their dimensions are as follows:

	DRY DOCK No. 1	DRY DOCK No. 2
Length	350 ft.	650 ft.
Width	85 ft.	85 ft.
Depth over sill (h.w.)	35 ft.	35 ft.

Because of the narrow approach channel, large vessels can be docked only at high tide. Three cranes of about 15-ton capacity each are available. Two of these are located on the south side of dry dock No. 2 and the other, between the docks.

2. *MYs ABRAM*.—A floating dry dock is moored at Mys Abram, on the west side of Kol'skiy Zaliv opposite Murmansk. The dock is 400 feet long, 71 feet wide, and 19 feet deep, and has a lifting capacity of 1,500 tons. Electric current is supplied from shore at 110-220 volts a.c., and from a generator in the dock at 110 volts d.c.

3. *MURMAN - RIBA TRAWLER BASE*.—A transverse marine railway capable of handling vessels up to 150 feet long is located at the Murman - Riba Trawler Base at the south end of the port. A storage area adjacent to the installation can accommodate about six vessels.

A group of four or five recessed slipways which may contain marine railways are located at the south end of the Base. Small destroyers, submarines, and trawlers have been seen hauled out in the slipways.

4. *FISHING PORT*.—A marine railway of 700-ton capacity is located in the Fishing Port adjacent to Trawler Repair Wharf (Reference No. 15).

(7) Trade of port

Trade during the prewar years 1934-1937 is summarized in TABLE VI-8. Statistics on domestic commerce are not available.

TABLE VI - 8
SUMMARY OF TRADE
Port of Murmansk

Year	Imports		Exports	
	Short tons	*Percent	Short tons	*Percent
1934	81,039	7.17	741,054	3.88
1935	82,726	5.96	633,010	3.34
1936	103,740	8.15	701,494	4.48
1937	118,056	8.33	833,557	5.83

* Percent of total USSR trade through ports.

(8) Naval establishments

Kol'skiy Zaliv is the principal Arctic naval base of the USSR, and Murmansk is administrative headquarters of the Northern Fleet "Service of the Rear" and the site of important naval installations.

The principal repair and operating base of the Northern Fleet is located at Rosta, 4 miles north of Murmansk. It is a first-class dockyard with two large graving docks, extensive shops, petroleum storage facilities, and a mine and torpedo depot. Details of the dry docks are covered under Topic (6), Repair facilities. The Murman - Riba Trawler Base at the south end of the port was an important patrol base during the war and had extensive repair facilities for smaller naval craft.

62. SECONDARY PORTS, NORTH COAST

A. Molotovsk (64°35'N, 39°47'E)

Molotovsk, located at the western end of the Severnaya Dvina delta on the south shore of the White Sea (Beloye More), is a commercial port of moderate size and the site of a large shipbuilding and repair yard (FIGURES VI-1 and VI-22).

It is a comparatively new port kept open all year by the use of ice breakers. The town, with a population of about 15,000, is situated 2 miles east of the port. The entire area has been reclaimed from former marshes and swamp-land by hydraulic fill (FIGURE VI-17). The streets and roads are paved with wooden planks. There are no exports and the imports during the war consisted largely of lend-lease shipments. Alongside accommodations are available in the commercial and shipyard sections of the port.

(1) Harbor

The harbor consists of the lower end of Nikol'shoye Ust'ye, southernmost tributary of the Severnaya Dvina, and is protected on the north by the island Ostrov Yagry. The harbor is about 1 mile long east-west and averages about 1,800 feet in width. The water area is about 250 acres with general depths of 28 to 30 feet (FIGURE VI-22). Tugs are required to assist in berthing.

(a) *Entrance channel*.—The harbor is entered through a dredged channel 180 feet wide and about 5 miles long. It is well marked by buoys and lights. Constant dredging is required to maintain the depth at 27 to 30 feet.



FIGURE VI-17. Molotovsk.
View of the port area. June 1944.

Vessels must proceed at slow speed because of the steep sides of the cut and the presence of dredges at work.

(b) *Anchorage.*—There is protected anchorage for about five vessels in the harbor, in depths of about 30 feet over mud and sand, good holding ground.

(c) *Hydrographic features.*—The lunitidal interval at the port is 5 hours 12 minutes; mean high water springs rise 3 feet; neaps, 2 ½ feet; and the mean level is 1 ½ feet.

The usual full strength of the current at ebb and flood tide is about 1 ½ knots.

(d) *Local weather.*—No data are available for the immediate area other than that the prevailing winds are north-northwest. September and October are the periods

of heaviest wind. It is believed that the weather conditions are similar to those at Arkhangel'sk.

(2) Terminal facilities

(a) *Piers and wharves.*—All wharves for deep-draft ships at Port Molotovsk are located on the south shore of the harbor. The western half of the waterfront is the commercial section of the port and here are located the main cargo wharf and two bunkering piers (FIGURES VI-18 and VI-22). The eastern half of the port is occupied by the shipyard and here are located two wharves which are probably used as fitting-out berths.

Port improvement is still in progress, particularly along the north shore of the harbor, and new wharfage may be

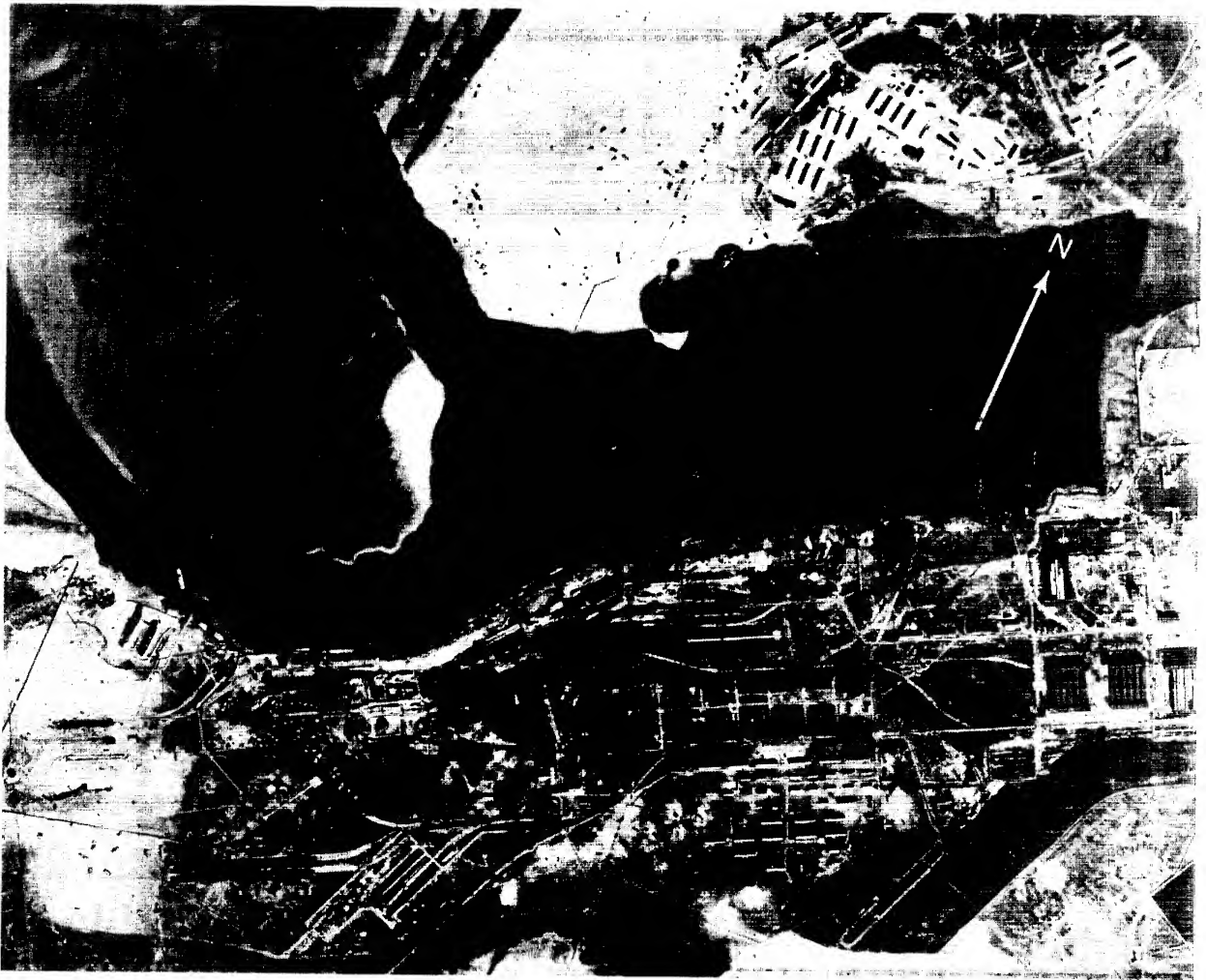


FIGURE VI-18. *Molotovsk.*
Commercial Harbor in W part of the port area. Aug. 1943.

available. Bulkheading and filling of a large section of the north shore, and construction of an inner basin or dock are principal elements of the program.

Main Wharf, in the commercial section of the port, is the only first-class cargo terminal in the port. In addition to its greater berthing capacity it is the only wharf fully provided with rail connections and storage and hoisting facilities (FIGURE VI-19).

Detailed soundings for the port are lacking, and precise depths alongside the wharves are not known. Depths alongside Main Wharf are charted at 27 feet (low water); however, it has been used by Liberty ships, which have a loaded draft of 28 feet. Among ships shown alongside wharves in FIGURE VI-18 are several of Liberty type.

Dimensions and constructional details of the wharves at the port of Molotovsk are shown in TABLE VI-9.

(b) *Mechanical handling facilities.*—In addition to the general cargo handling craneage on Main Wharf (FIGURE VI-19), there are two heavy-lift cranes available for general service in the port; both are floating. One, of 150-ton capacity, is self-propelled, and the other, of 50-ton capacity, is mounted on an unpowered barge.

(c) *Harbor craft.*—The assistance of tugs is required in all ship movements because of the constricted size of the



FIGURE VI-19. *Molotovsk.*
Looking W along the main wharf (Reference No. 2, FIGURE VI-22) of the Commercial Harbor. 1944.

TABLE VI - 9
PIERS AND WHARVES
Port of Molotovsk

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 22)		
	1 Oil Pier	2 Main Wharf	3 Coal Wharf
Location	W end of port.	West central waterfront.	Central waterfront.
Use	Bunkering and handling petroleum products.	General cargo handling.	Coal bunkering.
Type and construction	T-head pier; timber on open piling.	Shore wharf; timber and open piling.	Timber offshore wharf with 2 approaches.
Dimensions (feet):			
Length	Approx. 240 (face).	1,020+1,680 (face).	300 (face).
Depth of water (m. l. w.)	28 (approx.).	28 (approx.).	32 (approx.).
Width of apron	.....	Open wharf.	.....
Transit sheds:	None.	Four sheds.	None.
Construction	.....	Timber frame and siding.	.....
Length and width (feet)	.....	3 sheds, 200 by 25; 1 shed, 200 by 50.	.....
Number of floors	.....	One.	.....
Total floor area (sq. ft.)	.....	30,000.	.....
Mechanical handling facilities	Pipe lines lead from pier to tank farm 1,500 ft. southward.	Three 12-ton R.R. cranes. Four 3½-ton Lorain tractor cranes. One 20-ton electric crane. One 15-ton electric crane. Four 6-ton electric cranes. Two 3-ton electric cranes. One 12-ton caterpillar crane. Five portable conveyor belts.	Conveyor-belt system for loading coal.
Rail (5'0" gage) and road connections.	None on pier; one track to tank farm.	Several R.R. spurs to rear of wharf.	No rail or truck access on wharf.
Water supply	None.	Available from hose connections on wharf.	None.

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 22)	
	4 Shipyard Quay	5 Shipyard Wharf
Location	E waterfront.	E waterfront.
Use	Probably fitting out.	Probably fitting out.
Type and construction	Offshore wharf with 4 approaches.	Marginal wharf.
Dimension (feet):		
Length	Approx. 1,000 (face).	Approx. 600 (face).
Depth of water (m. l. w.)	No data.	No data.
Width of apron	do.	do.
Rail and road connections	No rail or road connections.	Accessible by trucks.
Remarks	Narrow wharf deck and approaches restrict clearance. Filling between wharf and shore may be planned or in some stage of progress. This would render wharf capable of normal rate of clearance. Dimensions are estimates only.	Dimension is estimate only.

harbor. This service is provided by three tugs stationed at the port:

NAME	LENGTH	HORSEPOWER
"Murman"	60 ft.	650
No. 8	70 ft.	600
No. 19	100 ft.	1,200

These tugs are used as harbor ice breakers during the winter.

There are reported to be no barges or lighters at Port Molotovsk.

(3) Storage facilities

(a) *Warehouses.*—Information on covered storage facilities other than the transit sheds located on Main Wharf is not available. Presumably there are some warehouses in the shipyard.

(4) Capacity and clearance

(a) *Unloading capacity.*—There are no detailed performance records of the amount of cargo discharged and

cleared; but in 1945, working cargo 24 hours each day, the stevedores averaged 840 short tons daily. How many ships being worked and the number of gangs employed is unstated.

(b) *Facilities for clearing port.*—A single-track railroad line connects Port Molotovsk with the Arkhangel'sk-Vologda Railroad at Isakogorka, 20 miles southeastward. Numerous spurs serve the port and shipyard area and a small marshalling yard lies east of the town.

Except for a few plank roads in the port area and town, there are no roads or highways serving Port Molotovsk. Overland communication is entirely by rail.

(5) Supplies

(a) *Petroleum.*—Five storage tanks with a total capacity of about 100,000 barrels are located about 1,500 feet south of the oiling pier (FIGURE VI-22, Reference No. 1). Four tanks of unknown capacity are located about 1,000 feet southeast of Main Wharf (Reference No. 2). Underground storage tanks are reported in the vicinity of

the coaling wharf (Reference No. 3); no details are available.

(b) *Coal*.—No details are available on the size of coal stocks or sources of supply. Three railroad spurs are laid to the rear of the coaling wharf (Reference No. 3).

(c) *Water*.—Fresh water is obtainable at Main Wharf, where pipes are laid. During spring and summer the rate of supply to ships is 200 tons daily. In winter, water supply is uncertain due to frozen pipes and lack of pressure.

The channel water in the vicinity of the port is brackish and unfit for boiler use. The tugs stationed at Port Molotovsk can supply water to ships; capacities range from 30 to 130 tons.

(6) Repair facilities

The majority of repair facilities are concentrated in the naval establishment and are discussed in paragraph (8).

(7) Trade of port

Trade for the prewar years 1934-1937 is summarized with that of Arkhangel'sk in TABLE VI-4.

(8) Naval establishment—Molotovsk Shipyard

Port Molotovsk is the site of a new shipyard; when completed it will be the largest shipbuilding center in the Soviet Union. Construction, initiated about 1937, was held up during the war and was resumed recently.

Although not classed as a naval base, the Molotovsk yard will be important to the Soviet Navy as a source of new fleet units. Upon completion, the yard will be capable of handling construction and repair of any size vessel, including battleships.

(a) *Layout*.—Molotovsk Shipyard is located east of the Commercial Port (FIGURE VI-22) and occupies an area estimated at 2,000 acres.

1. *Shops*.—Well-planned and modern in all respects, the yard has some 16 large shops erected to date; six of these are sufficiently finished to be usable. All are built with similar design—steel framework, brick siding, and saw-tooth roofs. In addition to the large shops there are numerous smaller wooden buildings for various purposes. A system of railroad spurs and sidings serves most of the yard.

Upon completion, the shipyard will have all the normal shops and equipment customary in a large plant of this type. Among the installations already completed are the following:

Precision machine shop.—Capable of doing any type of precision work, this shop is equipped with Russian and American machine tools, well arranged and spaced but up to the end of the war still not working over 25% of capacity. A testing laboratory and inspection center is operated in conjunction with this shop; it contains many testing machines of various types.

Heavy machine shop.—This shop is well equipped with heavy tools of Russian and British make. The large lathes are capable of turning destroyer shafts. Other equipment includes: vertical and horizontal planing machines, radial drilling machines, various size lathes, presses, electrical welding and cutting machines. In 1944 the heavy machine shop was not working over 10% of capacity.

Forge shop.—In 1944 equipment consisted of four comparatively small gas furnaces equipped to use either gas or oil, and two hammers. Items manufactured included: eye bolts, wire rope, clips and clamps, shackles, and miscellaneous deck fittings and fastenings.

Foundry.—Equipment includes several 5-ton and 1-ton furnaces; but only a small one was working in 1944, when bomb heads were being manufactured.

Sheet metal shop.—Designed to turn out subchaser hulls at the rate of one every 15 days, this shop probably never achieved that record during the war.

2. DRY DOCKS AND BUILDING WAYS

a. *Floating dry dock*.—A small floating dry dock measuring 180 feet long and 24 feet wide is moored at the west end of the fitting-out quay (Reference No. 4).

b. *Dry docks* (FIGURES VI-20 and VI-21).—Two dry docks, each capable of handling vessels of battleship size, are housed in a great 1,100- by 450-foot building. The installation can be used for either repair or new construction and is connected with the harbor by a tidal dock on the west side. In 1944 the tidal dock was still under construction.

c. *Building slip*.—A building slip comprising ten building ways is located on the northwest side of the yard. A transverse marine railway is provided at the west end of the slips for launching completed vessels via a small tidal lock.

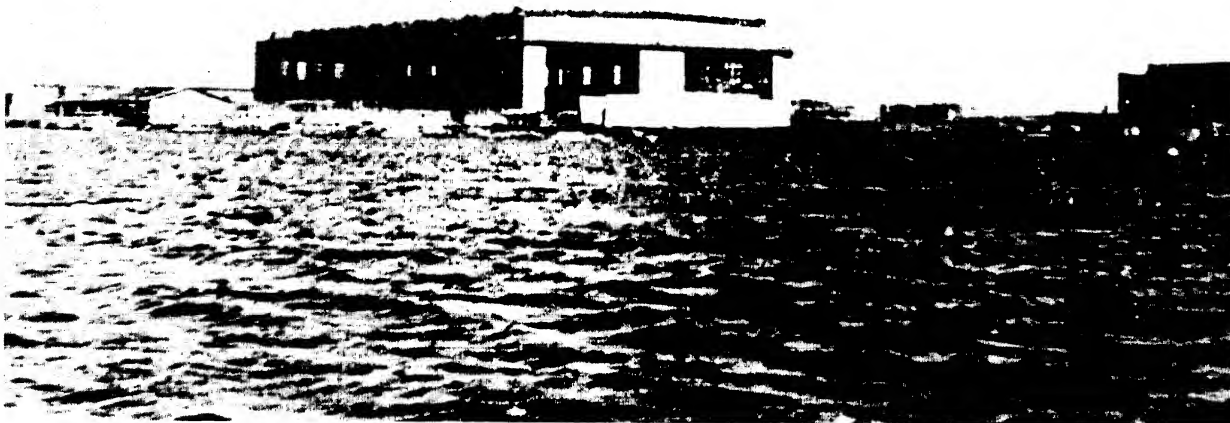


FIGURE VI-20. Molotovsk.
Looking at the NW corner of the large covered dry dock (Reference E, FIGURE VI-22). 1944.

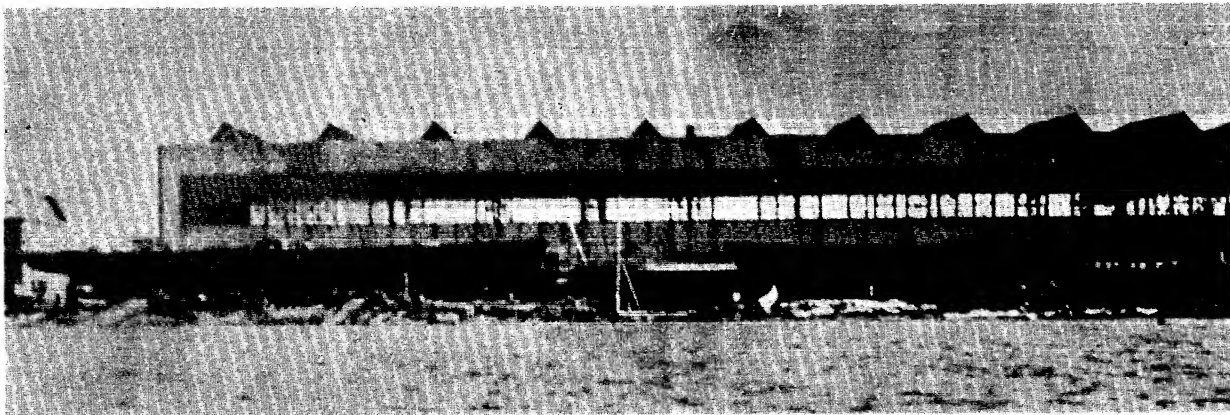


FIGURE VI-21. Molotovsk.

North side of the large covered dry dock (Reference E, FIGURE VI-22). Two 150-foot subchasers on building ways. 1944.

3. **PERSONNEL.**—In 1944, officials of the yard stated that 11,000 workers were employed there. It is doubted, however, that more than 6,000 were employed at that time. Postwar plans envisage a force of from 40,000 to 100,000 employees. At the present rate of construction, it will be several years before a plant requiring that number of people will be in operation.

4. **PRODUCTION.**—In 1944 production was still largely in the plans stage. When full capacity is realized, the yard will be able to build all classes of naval vessels up to battleship size and handle all classes of repair work.

Actual output until the end of the war is believed to have been a dozen or more subchasers (built by sub-assembly procedure) and an undetermined number of submarines. Two large destroyers were partially finished during the same period, and the keel laid for a battleship.

B. Onega (63°55'N, 38°04'E)

Onega (population, about 8,000) is located at the head of Onezhskaya Guba, a large gulf on the south side of the White Sea (Beloje More) (FIGURE VI-1). Sawmilling is the chief industry of the town, and the export of lumber is the principal function of the port. Shallow depths over the entrance bar and in the Onega (river) estuary on which the port is situated, limit use of the wharves to small, shallow-draft coasters. Larger vessels customarily work cargo in the roadstead. Onega is closed by ice from November until May.

(1) Harbor

The Onega (river) estuary and the off-lying roadstead form the harbor of Onega (FIGURES VI-23 and VI-24). All of the port facilities are located on the north bank of the river and are sheltered from wind and sea. The river is $\frac{3}{4}$ mile wide opposite the town, and 1 mile wide at its mouth; the general depths increase from 5 to 12 feet at the mouth to 19 feet abreast of the town. Shoals and bars occupy a large part of the estuary and navigation is restricted to the main channel, which runs close to the north bank.

(a) **Entrance channel.**—The entrance to the Onega is obstructed by large shoals and approach must be made through one of two channels. Dvinskiy Farvater, entering on the north, has natural depths of 2 to 5 feet at low water, and is used only by boats. Karel'skiy Farvater, entering from the west, is the main approach to the port and is maintained by dredging. In 1937 a maximum draft of 14½ feet could be carried through this channel at low water neaps. Both channels are marked by buoys.

(b) **Anchorage.**—Two anchorage areas are located in the roadstead seaward of the mouth of the Onega river. The roadstead in Dvinskaya Guba lies between the islands Shogly Ostrova and the mainland to the south and east and has depths ranging from 12 to 36 feet. A roadstead located southwest of Shogly Ostrova has depths ranging from 15 to 25 feet. The roadstead in Dvinskaya Guba is the better sheltered and more commonly used of the two. The usual anchorage is 2 miles each of Shogly Ostrova in 21 to 23 feet. Bottom sediments in both roads consist primarily of mud and sand.

(c) **Hydrographic features.**—The mean high water lunital interval at the entrance is 8 hours 58 minutes. Mean high water springs rise 5½ feet, and neaps 4½ feet; the mean water level is 2¾ feet.

The flood tide sets southeastward and southward through both roads and into the river, beginning at the island Ostrov Kiy about 5 hours before high water and continuing for about 6 hours. The ebb begins about an hour after high water and continues for about 6½ hours. The velocity of the flood tide is usually about ½ knot in the river mouth and is scarcely perceptible in the spring during freshet periods. In the river and on the bar, the ebb velocity is about 2½ knots.

Onega (river), bar, and roads are covered with ice from the beginning of November to about the middle of May. It is not possible for a vessel to winter afloat in the port.

(d) **Local weather.**—Prevailing winds at Onega are north and northwest and occasionally reach a force of 4 to 6.

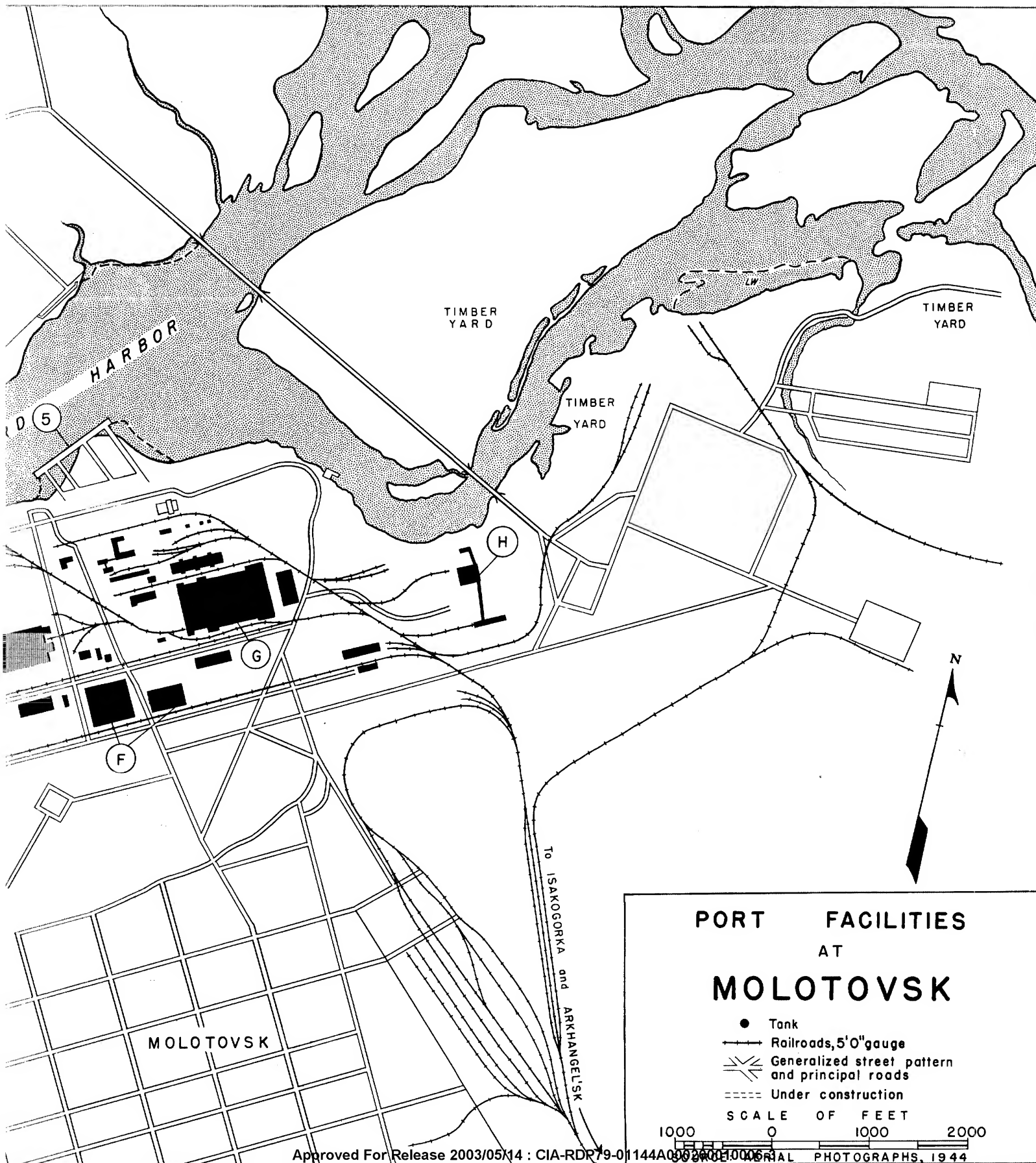
(2) Terminal facilities

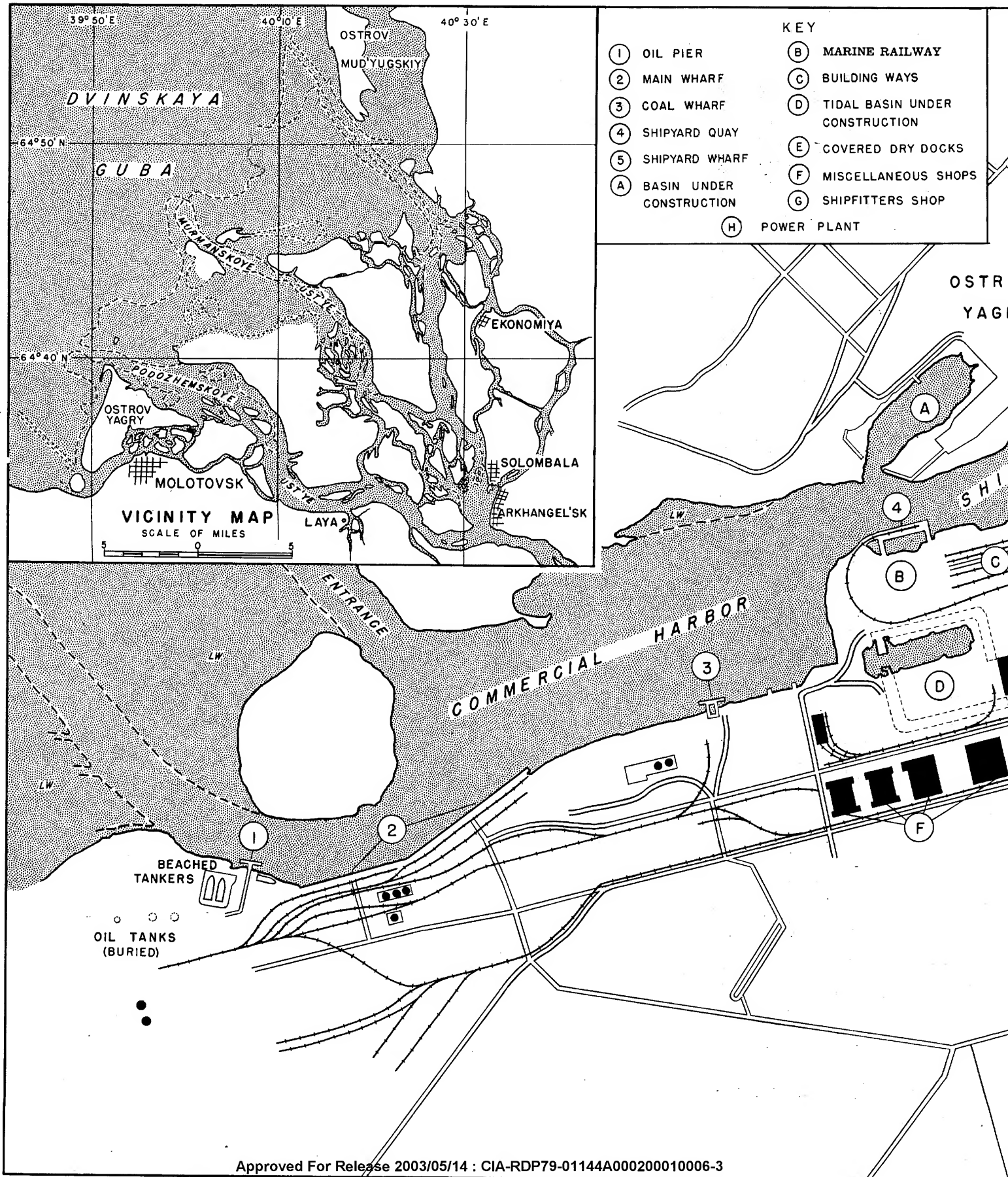
(a) **Piers and wharves.**—Four wooden wharves comprise the terminal facilities at Onega and provide a total of 3,390 linear feet of berthing space, with depths alongside ranging from 8 to 16 feet. Accommodations are available for vessels drawing 12 to 14 feet, or for a lesser number of larger vessels at reduced draft. Depths over the bar limit the draft of entering vessels to 14 feet; thus, it is customary for larger vessels to discharge partially by lighter in the roadstead and then move in on light draft. The port's two principal wharves are associated with sawmills and normally are used exclusively for the shipment of lumber. All of the wharves are probably limited in their capacity for handling general cargo.

Dimensions and constructional details of the wharves are shown in TABLE VI-10.

(b) **Mechanical handling facilities.**—No wharf cranes or other cargo-handling equipment are available.

FIGURE VI-22
MOLOTOVSK PORT PLAN
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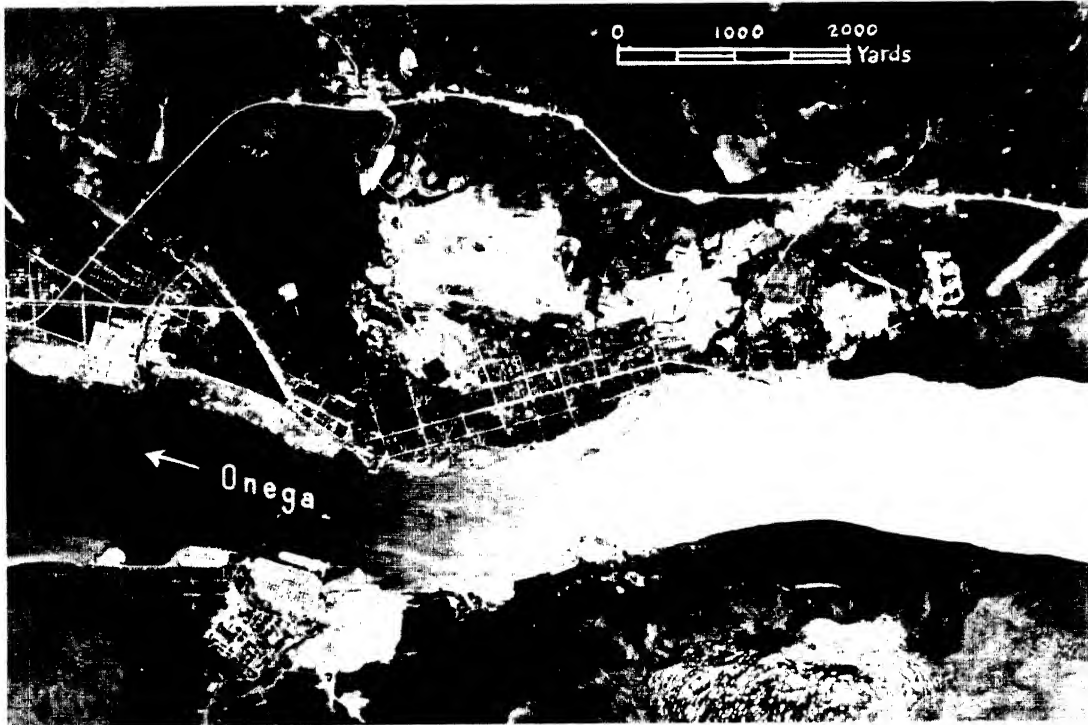




FIGURE VI-23. *Onega, aerial views.*
Top right: small scale of the area including the Export Wharf (Reference No. 1) which is not shown on the larger scale photograph. 1942. Bottom: Larger scale view of most of the town and wharf facilities (Reference Nos. 2, 3, and 4, FIGURE VI-24). 1943.



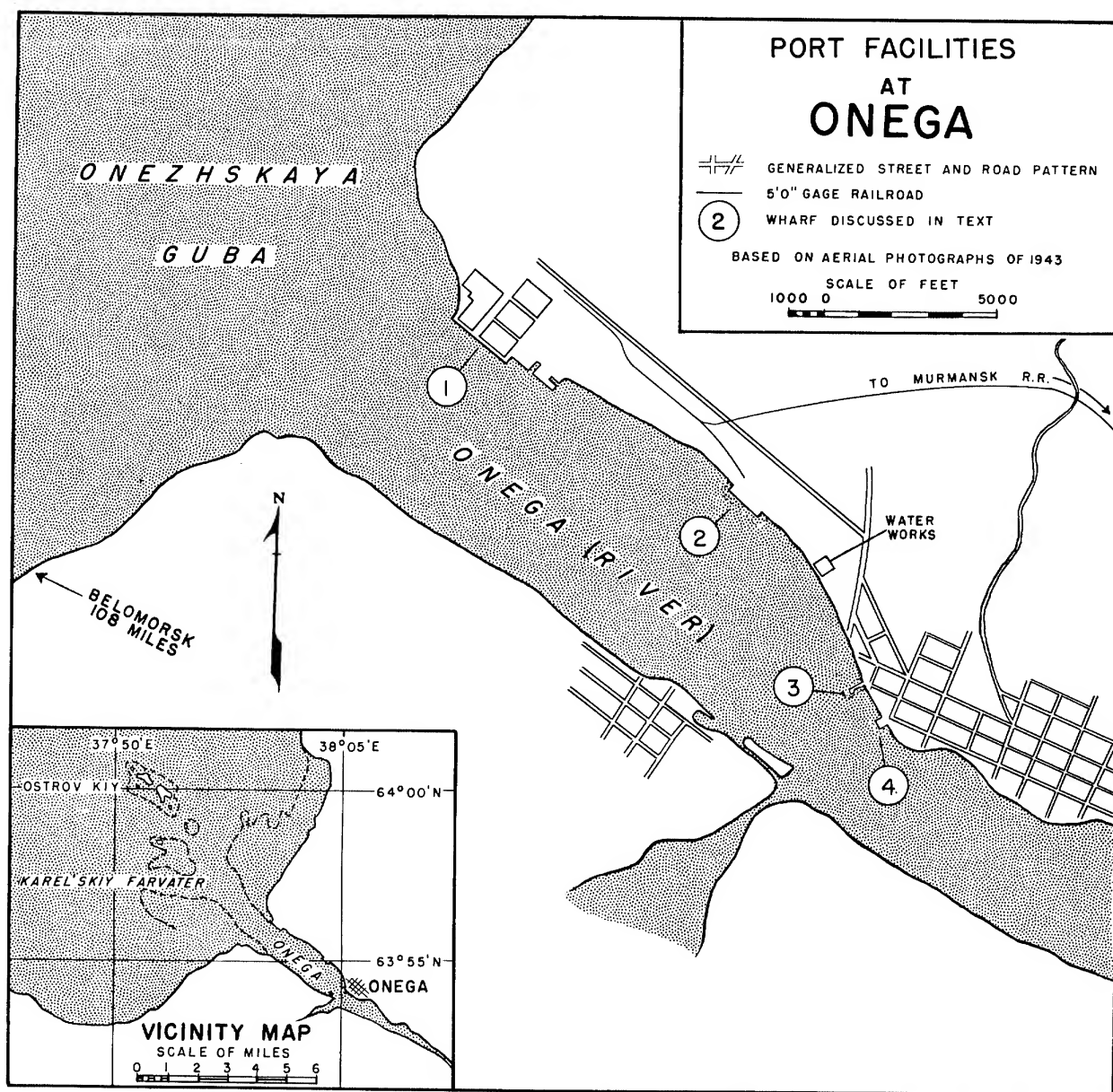


FIGURE VI-24. Onega.
Plan of port.

(c) *Harbor craft.*—One large and two small tugs are based at the port, and there are ten barges of 50-ton capacity each. Several of the barges are reported to be in poor condition.

(3) Storage facilities

No data are available on covered storage facilities at Onega. Three transit sheds are on Town Wharf. Large areas suitable for open storage are available throughout the waterfront area. The lumber-stacking yards adjacent to the sawmills are particularly adaptable for this purpose.

(4) Capacity and clearance

(a) *Unloading capacity.*—No data are reported for the unloading capacity of the port. Outload of cargo, mostly lumber, averaged about 800 short tons per work-day between 1934 and 1937.

(b) *Facilities for clearing port.*—A branch line of the Murmansk railway, extending from Belomorsk to Obozerskaya on the Arkhangel'sk - Vologda line, passes through Onega and a spur serves the Export Wharf. There are no good road connections. Onega is a port of call for coastal steamers connecting with Arkhangel'sk and is a terminus for small light-draft craft operating on the river as far as Kargopol', 200 miles upstream.

(5) Supplies

(a) *Petroleum.*—No data are available on the availability of bunkers. A new petroleum storage installation located west of town near Sawmill Wharf was reported near completion in 1943, and included at least nine small tanks.

(b) *Water.*—Fresh water is not available at the wharves. A small waterworks is located on the waterfront between Sawmill Wharf and Boat Pier.

TABLE VI - 10
PIERS AND WHARVES

Port of Onega

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 24)					
	1 Export Wharf	2 Sawmill Wharf			3 Boat Pier	
Location	Lower waterfront.	Middle waterfront.			Upper waterfront.	
Use	Shipment of lumber, general cargo.	Shipment of lumber.			Small craft landing.	
Type and construction	Marginal wharf of open piling, timber deck.	Marginal wharf of open piling, timber deck.			Offshore wharf; narrow 280-ft. shore connection. Open piling, timber deck.	
Dimensions (feet):		Face	W Side	E Side	Face	W Side
Length	2,000 (face).	1,000	100	100	90	100
Depth of water (m. l. w.)	8.	16	.....	.....	8	5 to 8
Berthing space available	2,000.	1,000	.....	.....	90	100
Width of apron	Open wharf.	Open wharf.			Open wharf.	
Height of deck above low water.	10.	10.			10.	
Rail (5'0" gage) and road connections.	Tracks at rear of wharf; truck access to wharf.	Tracks 500 yards to rear of wharf; truck access to wharf.			No rail; truck access to pier.	
Remarks	Vessels must breast a few feet off the wharf.	Vessels must breast a few feet off the wharf.			.....

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 24)	
	4 Town Wharf	
Location	Upper waterfront.	
Use	General cargo and passengers.	
Type and construction	Wooden marginal wharf facing filled area.	
Dimensions (feet):		
Length	200 (face).	
Depth of water (m. l. w.)	8.	
Berthing space available	200.	
Width of apron	No data.	
Height of deck above low water.	10.	
Transit sheds:	Three sheds.	
Construction	Wooden.	
Length and width (feet)	130 by 50; 120 by 40; 80 by 30.	
Number of floors	One.	
Total floor area (sq. ft.)	13,700 (all sheds).	
Rail and road connections	No rail; truck access to wharf.	
Remarks	Vessels must breast a few feet off wharf.	

(6) Repair facilities

No drydocking or repair facilities are available at Onega.

(7) Trade of port

No information available on domestic commerce. Imports during the period 1934-1937 were negligible or unreported. Chief imports are machinery, salt fish, and coal. Exports consist almost entirely of timber; data for 1934-1937, in volume and in percent of total USSR export trade, are tabulated below:

YEAR	SHORT TONS	PERCENT
1934	226,729	1.19
1935	289,865	1.53
1936	246,074	1.57
1937	234,168	1.64

C. Belomorsk (64°32'N, 34°48'E)

Belomorsk (population, about 15,000) is located on the west coast of Onezhskaya Guba, a large gulf on the south side of the White Sea (Beloje More) (FIGURE VI-1). The town is an important sawmilling center and the northern terminus of the Stalin White Sea - Baltic Canal (Belomorsko-Baltiyskiy Kanal Imeni Stalina). The export of lumber and pulpwood is the principal activity of the port.

Shallow depths in the breakwater-protected inner harbor limit use of the wharves to small cargo vessels, but anchorage for larger vessels is available in the roadstead. Belomorsk is closed by ice from the middle of October until the middle of May.

(1) Harbor

Belomorsk is situated at the head of a small bay, Sorokskaya Guba (FIGURE VI-25), into which empty the two distributaries of the river Vyg. The bay and mouths of the river form an inner harbor protected by breakwaters; the unprotected outer portion of the bay (Sorokskaya Guba) makes up the roadstead. The shoreline of the inner harbor is highly irregular and there are several off-lying rocks and shoals, particularly in the southern part. Natural depths range from 25 to 30 feet at the entrance between the heads of the north and south breakwaters, but decrease inside to an average of 15 to 20 feet. Approach channels to the various wharves are maintained by dredging.

The southern distributary of the Vyg is canalized in the vicinity of Belomorsk and is diverted from its natural mouth outside the south breakwater through an artificial cut northward into the harbor to form the canal outlet. Lock No. 19 is located at the seaward end of the cut and



FIGURE VI-25. Belomorsk.
Port and harbor area. Note the entrance to the Stalin White Sea-Baltic Canal and the diversion dam on the south distributary of the river, Vyg. 1942.

Lock No. 18 is located about 1.5 miles upstream.

(a) *Entrance channel.*—Approach to the roadstead in Sorokskaya Guba can be made without difficulty. Entrance to the inner harbor between the breakwaters is about 800 feet wide, and inside, a dredged channel about 2 miles long and 300 feet wide leads to the head of the harbor. In 1936 this channel had depths of 15.5 feet.

(b) *Anchorage.*—Anchorage within the inner harbor is suitable for small craft only, but in the roadstead extensive anchorage is available in depths of 20 to 36 feet. The roadstead is exposed to the northeast, and winds from that direction may cause a heavy sea.

(c) *Hydrographic features.*—The mean high water lunital interval at Belomorsk is 6 hours 06 minutes. Mean high water springs rise 4.75 feet, and neaps rise 4 feet. The mean water level is 2.5 feet. The port is closed to navigation by ice between the middle of October and the middle of May.

(2) Terminal facilities

Because of shallow depths alongside, none of Belomorsk's wharves can accommodate large vessels. The six principal wharves provide 3,135 linear feet of berthing space with depths of 15 to 20 feet alongside. A large amount of wharf space suitable only for lighters and small craft is also available.

All but one of the wharves are located on off-lying semi-natural moles connected with the shore by either narrow bridges or causeways. Capacity for general cargo discharge probably would be limited by inadequate means of clearance to shore (FIGURE VI-26). The surfaces of moles on which lumber export wharves are located are devoted to lumber storage.

In recent years the port has been under a program of expansion; new protective breakwaters have been constructed and some of the moles are being enlarged by filling.

TABLE VI - 11
 PIERS AND WHARVES

Port of Belomorsk

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 26)		
	1 Fueling Wharf	2 Quay	3 Pier
Location	NE side of harbor.	NE side of harbor.	SW side of harbor.
Use	Handling of petroleum products.	Handling general cargo.	Handling general cargo.
Type and construction	Timber and piling wharf lying off mole at end of north harbor breakwater. Single trestle connects wharf with mole.	Masonry quaywall on S side of mole at end of north harbor breakwater.	Curved pier of open piling with wooden deck.
Dimensions (feet):			
Length	190 (face).	290+970 (face).	Face, 40; length, no data.
Depth of water (m. l. w.)	20.	20.	15 (at face and S side of pierhead).
Berthing space available	190.	290+970.	275 (S side of pierhead).
Width of apron	24 (width of wharf).	50' at shed; elsewhere open.	15 at shed; elsewhere open.
Capacity per square foot	No data.	Unlimited.	No data.
Transit sheds:	None.	One shed.	One shed.
Construction	.....	Wooden frame and siding.	Wooden frame and siding.
Length and width (feet)	.....	190 by 60.	140 by 25.
Number of floors	.....	One.	One.
Total floor area (sq. ft.)	.....	11,400.	3,500.
Mechanical handling facilities	Pipe line connecting with storage tanks on mole.	No data.	No data.
Rail (5'0" gage) and road connections	No rail; truck access to mole at rear of wharf.	Tracks on apron and at rear of shed; truck access to wharf.	Tracks on pier; truck access to pier.
DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 26)		
	4 Wharf	5 Wharf	6 Wharf
Location	SW side of harbor.	SW side of harbor.	SW side of harbor.
Use	Shipment of lumber.	Shipment of lumber.	Shipment of lumber.
Type and construction	Marginal wharf of open piling with timber deck, located on W side of semi-natural detached mole.	Marginal wharf of open piling with timber deck, located on N side of semi-natural detached mole.	Marginal wharf of open piling with timber deck, located on W side of semi-natural detached mole.
Dimensions (feet):			
Length	220 (face).	450 (face).	740 (face).
Depth of water (m. l. w.)	15.	15.	15.
Berthing space available	220.	450.	740.
Width of apron	Open wharf.	Open wharf.	Open wharf.
Rail and road connections	No rail; wharf and mole connected with mainland by road.	No rail; wharf and mole connected with mainland by road.	No rail; wharf and mole connected with mainland by road.
Remarks	Entire area of mole on which wharf is located used for lumber storage.	Entire area of mole on which wharf is located used for lumber storage.	Entire area of mole on which wharf is located used for lumber storage.

Dimensions and constructional details of the principal piers and wharves at Belomorsk are shown in TABLE VI-11.

(3) Storage facilities

Aside from two transit sheds on the general cargo wharves, there are no covered storage facilities in the port area. The series of moles in the southern part of the harbor, although normally used for lumber storage, provides about 45 acres of clear space suitable for open storage of general cargo. All of the moles are cleared by causeway to shore.

(4) Capacity and clearance

(a) *Unloading capacity.*—Unloading capacity of the port is limited, but there are no data on past performance.

(b) *Facilities for clearing port.*—Belomorsk is on the Muurmansk - Leningrad Railway, and the port area and wharves in the north part of the harbor are served by spurs. A road, paralleling the railroad, connects the port with Kem' and Kandalaksha. Other roads provide local distribution.

The Stalin White Sea - Baltic Canal provides a connection between the Gulf of Finland and the White Sea. The canal reduces the water route between Leningrad and Arkhangel'sk from about 2,200 miles (around the Scandi-

navian Peninsula) to less than 500 miles. The canal has a minimum depth of 13 feet and is accessible to vessels with a beam of 55 feet. Before World War II torpedo boats, "L"-class submarines, and *Engels*-class destroyers could use the canal. In 1940 the canal was reported in the process of being enlarged and deepened.

An airfield is located immediately south of the town, and there is a seaplane base at the outer breakwater (FIGURE VI-25).

(5) Supplies

Two or more petroleum storage tanks are located on the mole at the rear of the Fueling Wharf (Reference No. 1, FIGURE VI-26), but the capacities and the type of products stored are unknown. No information is available on the supply of coal, water, or electric power.

(6) Repair facilities

No drydocking facilities are available, but limited machinery repairs can be handled in shops at the sawmills.

(7) Trade of port

Statistics on domestic commerce are not available. Imports for the years 1934-1937 were negligible. Export trade consisted principally of lumber and pulpwood. The

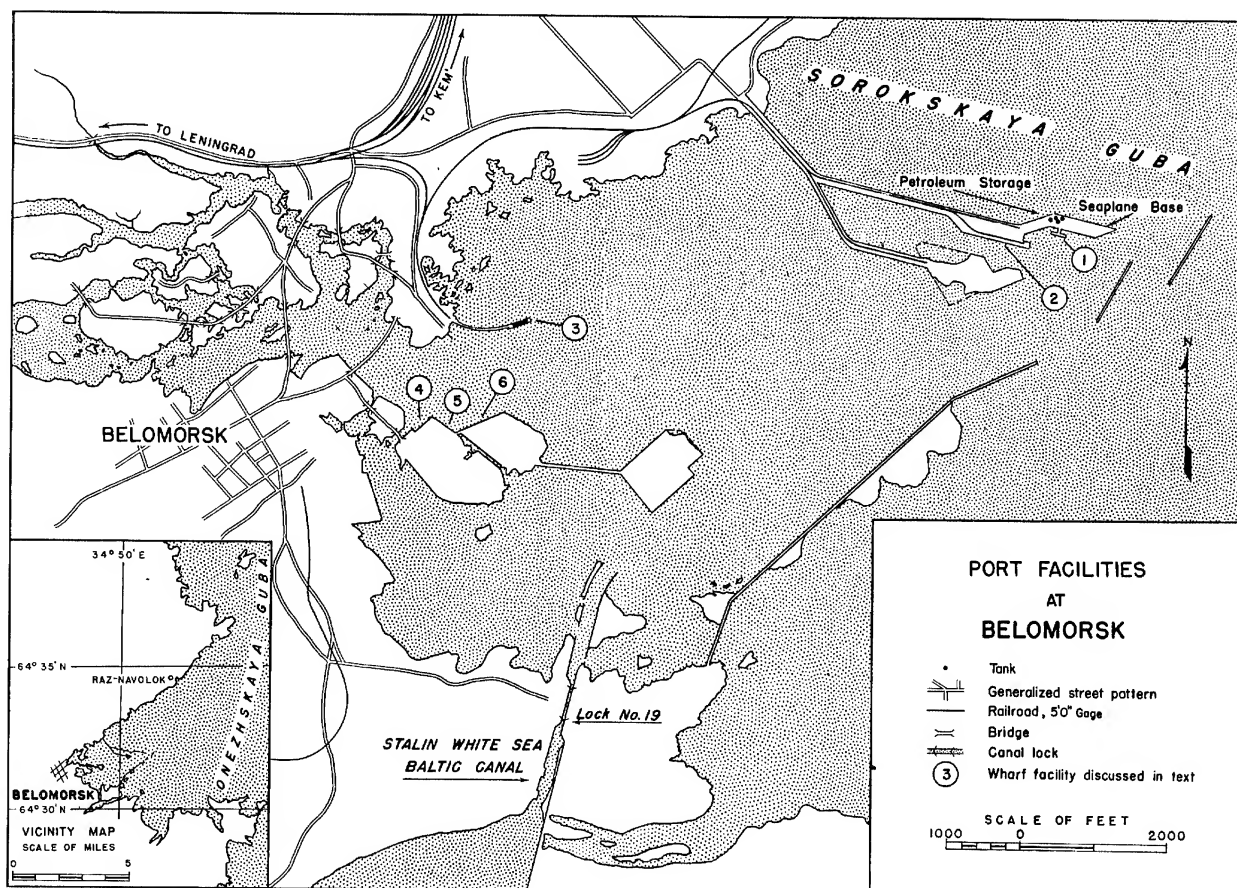


FIGURE VI-26. Belomorsk.
Plan of port.

volume and percent of total USSR exports for those years are tabulated below:

YEAR	SHORT TONS	PERCENT
1934	46,165	0.24
1935	59,885	0.32
1936	65,923	0.42
1937	75,202	0.53

D. Kem' (64°57'N, 34°37'E)

Kem' (population, about 2,600) is located at the head of a small inlet on the west coast of the White Sea (Belaye More) (FIGURE VI-1). The town is a sawmilling center and the site of several military supply installations. The port, Rabocheostrovsk (64°59'N, 34°47'E), is situated about 7 miles northeast of Kem' and is used primarily for the export of lumber. Kem' is closed by ice from December until May.

(1) Harbor

The town of Kem' is located at the head of Kem' inlet, a 4-mile-long estuary into which empties the river Kem'. Because of shallow depths in the inlet, only light-draft vessels can enter, and port facilities at Kem' town are limited to landings for small craft (FIGURE VI-27). The deepwater port for Kem' is located on the southern end of Ostrov Rabocheostrovsk, an island just north of the entrance to Kem' inlet (FIGURE VI-28). Ostrov Rabocheostrovsk lies parallel to the mainland and the narrow passage between is crossed by a series of causeways and

bridges. Port facilities are concentrated on the east side of Ostrov Rabocheostrovsk; and Kemskaia Salma, the strait between Ostrov Rabocheostrovsk and Ostrov Yak, forms the harbor. The strait is about 1.5 miles long and ranges in width from 0.5 mile at the northern end to about 1,000 feet at the southern end. Depths range from 18 to 36 feet.

(a) *Entrance channel.*—The waters off Kem' inlet are fouled for a considerable distance seaward by numerous islets and shoals, and the port must be approached with caution. Approach is made from the east through the channel Rombakskiy, and the port is entered on the north between Ostrov Rabocheostrovsk and Ostrov Yak. The Rombakskiy is less than 600 feet wide in places and has a least charted depth of 24 feet. The fairway is marked by buoys and lighted beacons.

(b) *Anchorage.*—Anchorage can be made in Kemskaia Salma off the port, and outside just north of the island Ostrov Yak.

(c) *Hydrographic features.*—The mean high water lunital interval at Kem' is 4 hours 33 minutes. Mean high water springs rise 6 feet and neaps rise 5 feet. The mean water level is 3.5 feet. Tidal currents in the harbor attain velocities up to 3 knots. Kem' is closed to navigation by ice from the early part of December to the middle of May.

(d) *Local weather.*—The mean annual temperature is 32.9°F., with an extreme range of from 94°F. to -41°F. The average annual precipitation is 18.36 inches. Prevailing winds are south through southwest to west; and

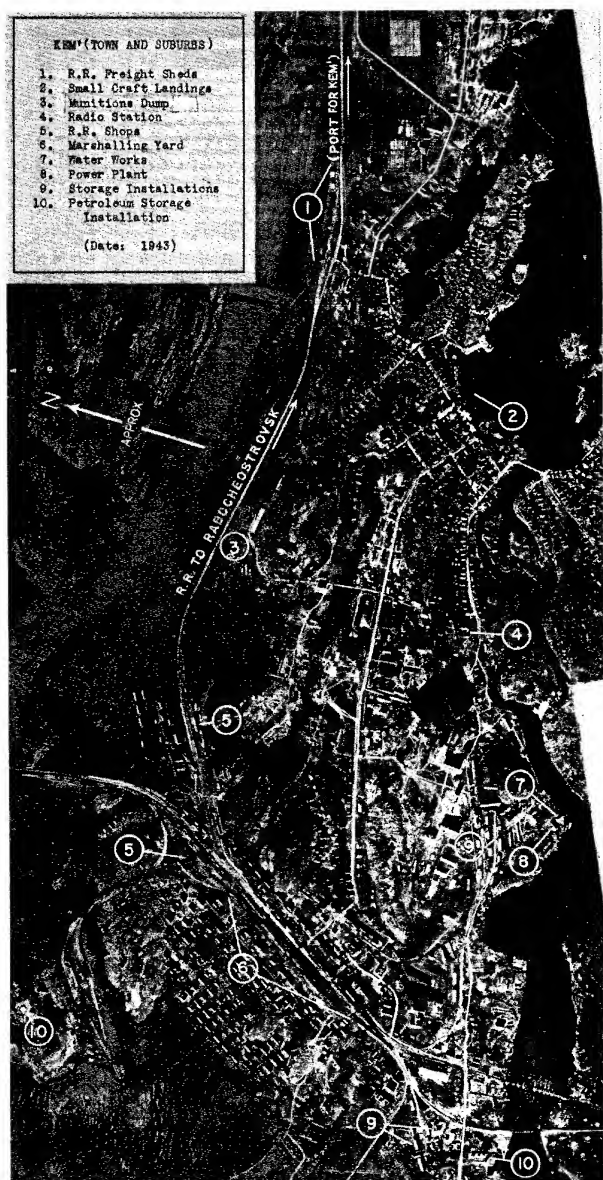


FIGURE VI-27. Kem', and the immediate vicinity. 1943.

the mean velocity is 9 m.p.h. Fog occurs on about 20 days per year.

(2) Terminal facilities

Terminal facilities at the port for Kem' consist of a large pier with depths of 28 to 32 feet alongside, and three marginal wharves with depths of 18 to 20 feet alongside (FIGURE VI-30). All the wharf structures are of open-piling construction with timber decks. The marginal wharves, located in the central part of the port, are associated with sawmills and are used exclusively for loading small lumber carriers (FIGURE VI-29). The pier, at the north end of the port, is used for the transshipment of general cargo and will accommodate large cargo vessels. Only the general cargo pier and the northernmost of the lumber wharves are served by rail. Numerous small-boat landings are located both in the port area and at Kem'.

Dimensions and constructional details of the principal wharves at Kem' are shown in TABLE VI-12.

(3) Storage facilities

A group of three warehouses is located in the north part of the port adjacent to the railroad spur which serves the Import - Export Pier. The buildings have an aggregate floor area of about 27,000 square feet and are reportedly used for the storage of munitions and foodstuffs. Large open storage areas are located adjacent to the sawmills and lumber wharves, but normally are used for lumber stacking.

Several freight sheds are located in the railroad yard in Kem' proper, and in addition there are several installations for various types of storage located in and around the town (FIGURE VI-27).

(4) Capacity and clearance

(a) *Unloading capacity.*—There are no data available on performed rates of discharge or clearance.

(b) *Facilities for clearing port.*—Kem' is located on the Murmansk - Leningrad Railroad (5'0" gage), and a branch line serves the port area seven miles northeast of town. A railroad yard with several sidings, freight sheds, and repair shops is located in the town. In the port area, railroad spurs serve the general cargo pier and one of the lumber wharves.

Ostrov Rabocheostrovsk, on which the port for Kem' is located, is connected with the mainland by a causeway carrying the railroad, and by two road bridges.

Kem' is connected by road with Kandalaksha and Belomorsk, and there is regular steamer service with other White Sea ports during the ice-free season.

TABLE VI - 12
PIERS AND WHARVES
Rabocheostrovsk (Port for Kem')

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 30)		
	1 Export-Import Pier	2 Lumber Wharf	
Location	N end of port	Central part of port.	
Use	Handling general cargo in overseas trade.	Shipment of lumber.	
Type and construction	Curved pier of open piling with timber deck.	Marginal wharf of open piling with timber deck.	
Dimensions (feet):			
Length	Face 60 N Side 1,270 S Side 1,330	600 + 230 (face).	
Depth of water (m. l. w.)	32	20.	
Berthing space available	.....	600 + 230.	
Width of apron	Open pier.	Open wharf.	
Mechanical handling facilities	One 20-ton crane.	No data.	
Rail (5'0" gage) and road connections.	Tracks run full length of pier; truck access to pier.	Tracks at rear of wharf; truck access to wharf.	
Electricity	Electric lighting on pier.	No data.	
Remarks	Berthage limited to S side of pier.	.....

TABLE VI - 12 (Continued)

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: Figure VI - 30)	
	3 Lumber Wharf	4 Lumber Wharf
Location	Central part of port.	Central part of port.
Use	Shipment of lumber.	Shipment of lumber.
Type and construction	Marginal wharf of open piling with timber deck.	Marginal wharf with pier extension on S end; open piling with timber deck.
Dimensions (feet):		
Length	750 (face).	1,110 (face).
Depth of water (m. l. w.)	20.	18.
Berthing space available	750.	1,110.
Width of apron	Open wharf.	Open wharf (pier extension on S end, 38 ft. wide).
Mechanical handling facilities	No data.	No data.
Rail and road connections	No rail; truck access to wharf.	No rail; truck access to wharf.

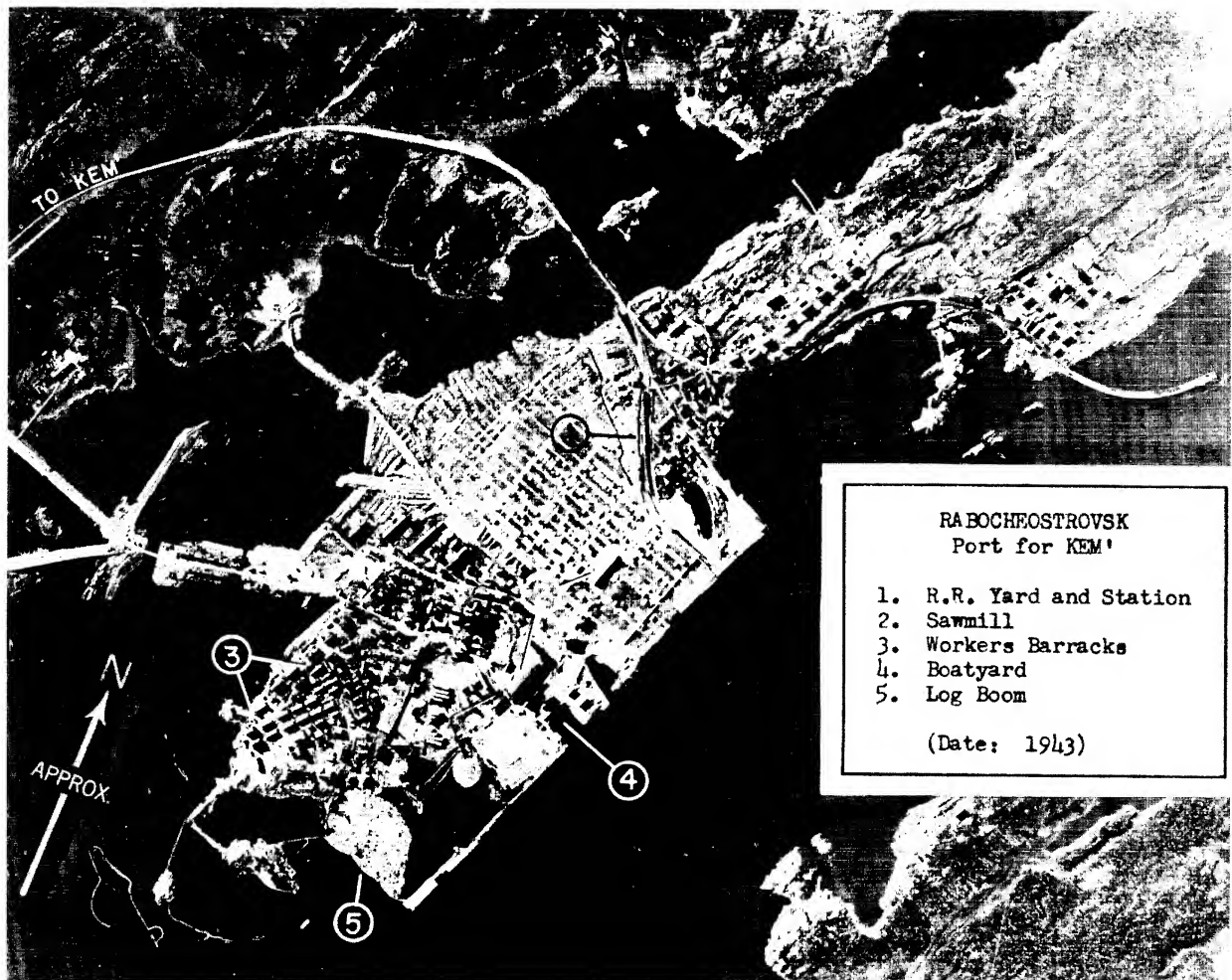


FIGURE VI-28. Kem'.
View of Rabocheostrovsk, the deepwater port for the town of Kem'. 1943.

(5) Supplies

No data are available on bunkering facilities at the port; however, there are apparently no installations of any appreciable size in the port area. About 500 yards northwest of the railroad yard at Kem' (FIGURE VI-27) is a petroleum storage installation consisting of at least five tanks of about 45-foot diameter. The area is served by railroad sidings, and just to the southeast is a coal yard.

Another group of three tanks of about 25-foot diameter is located at the southwest part of town at the north end of the railroad bridge across the Kem' (river). Water is supplied to vessels in the harbor by water boat.

(6) Repair facilities

There are no facilities for the drydocking or major repair of oceangoing vessels. A repair yard for small craft is located in the central part of the port.

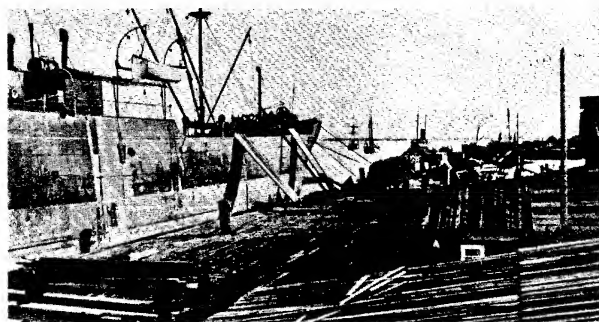


FIGURE VI-29. Kem'.

Wharf (Reference No. 2) at Rabocheostrovsk, the deepwater port for the town of Kem'. No date.

(7) Trade of port

There are no data on domestic commerce. Imports are negligible. Exports are mostly lumber; the available statistics for 1934-1937 showing volume and percent of total through USSR ports are tabulated below:

YEAR	SHORT TONS	PERCENT
1934	44,951	0.23
1935	44,925	0.24
1936	46,434	0.30
1937	65,927	0.46

E. Kandalaksha (67°08'N, 32°25'E)

Kandalaksha is located at the head of Kandalakshskaya Guba, the western arm of the White Sea (Beloje More) (FIGURE VI-1). The town occupies the east bank at the

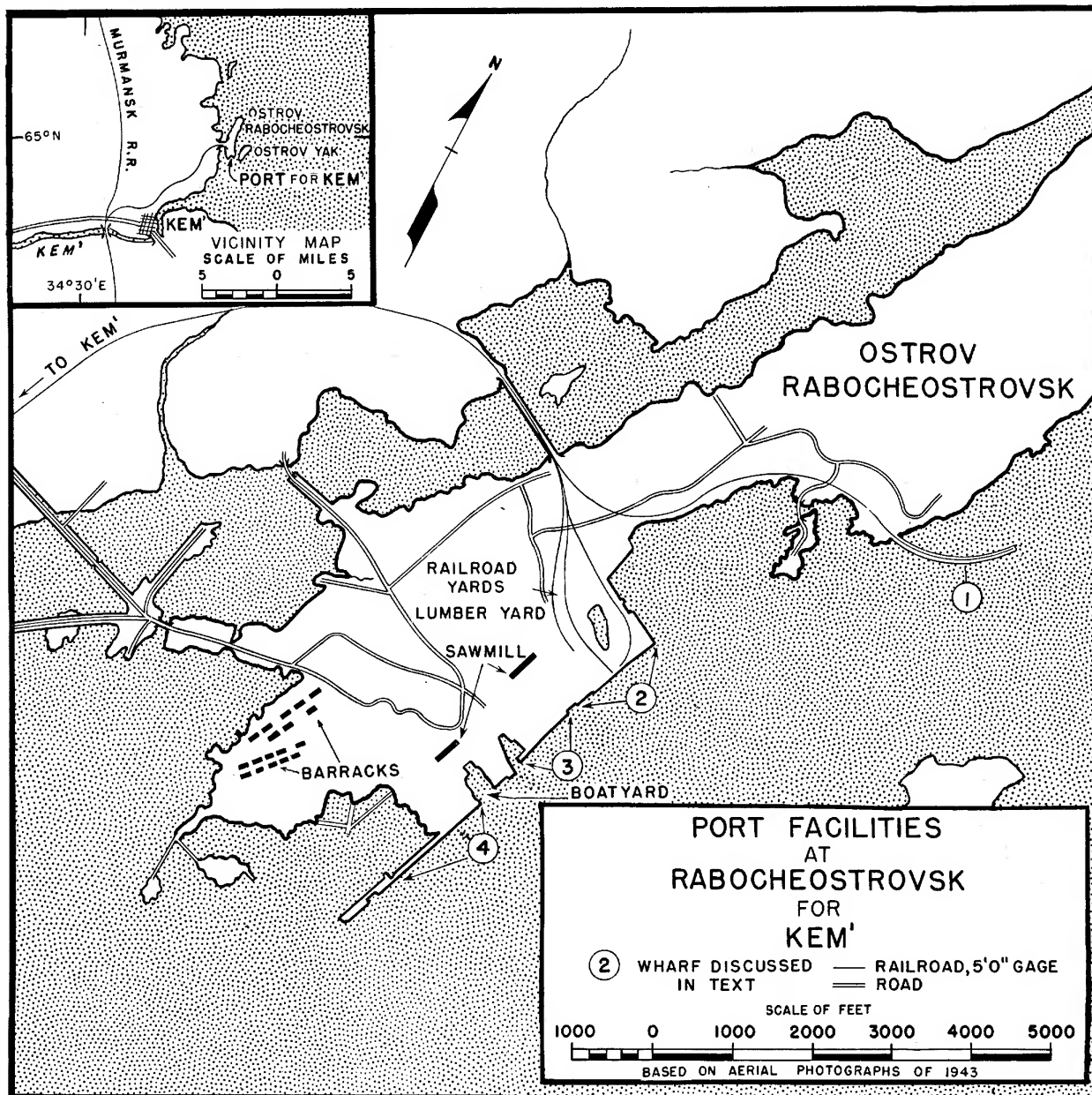


FIGURE VI-30. Kem'.

Plan of port at Rabocheostrovsk, the port for Kem'.

mouth of the river Niva, and its port facilities are located one-half mile northwest, on the margin of the bay. Although primarily a lumbering and fishing center, Kandalaksha is also the site of an aluminum plant, an electrochemical plant, and a machinery works. The principal exports are lumber, apatite, canned fish, and iron castings and metal work. The port is ice-free for about five months of the year. Good anchorage is available for several large vessels.

(1) Harbor

The harbor, formed in the head of the gulf, is well-sheltered and is practically landlocked (FIGURES VI-31 and VI-33). It is about 3.5 miles long and ranges from 0.5 to 1 mile in width. Depths range from 7 to 38 fathoms.

(a) *Entrance channel.*—The 150-mile approach to the port through Kandalakshskaya Guba is largely clear, deep, and unobstructed. Headward from a point 15 miles southeast of Kandalaksha, the central and southwest parts of the gulf are obstructed by numerous islets and rocks; but the fairway, which lies close to the northeast shore has a clear width of 1.2 to 4 miles and depths of 5 to 38 fathoms. Range lights and beacons are provided to facilitate navigation.

(b) *Anchorage.*—The anchorage off the town has depths of 15 to 38 fathoms, mud over rock bottom. Small vessels usually anchor between the 6- and 10-fathom con-

tours, about 1,200 feet offshore. Large vessels anchor about 800 yards southwest of the wharves, in depths of 27 to 32 fathoms, or about 600 yards farther northwestward in a depth of 24 fathoms over mud bottom. About 15 first-class and 10 second-class anchorage berths are available in the harbor.

(c) *Hydrographic features.*—The lunitidal interval at the port is 3 hours 01 minute; springs rise 7.25 feet and neaps 6 feet.

The tidal stream sets northwestward through the harbor from 10 to 4 hours after the moon's meridian passage, and southeastward from 4 to 10 hours after the moon's meridian passage. Both streams attain a velocity of from 1 to 2 knots.

(d) *Local weather.*—No meteorological statistics are available for Kandalaksha. In spring, frequent winds are either fresh northwesterly or southeasterly with clear weather, and easterly and northeasterly with snow. In summer, either northerly to westerly winds with fine weather, or northeasterly and southeasterly winds with fog and rain prevail; southwesterly winds are rare. In autumn, northeasterly and southwesterly winds are fresh, with wet weather. In winter, cold northerly and northeasterly winds occur, with fine weather; southeasterly and easterly winds are warm and strong. The port is icebound from early November until the end of May.



FIGURE VI-31. Kandalaksha.
View of the port and vicinity. Prior to 1944.

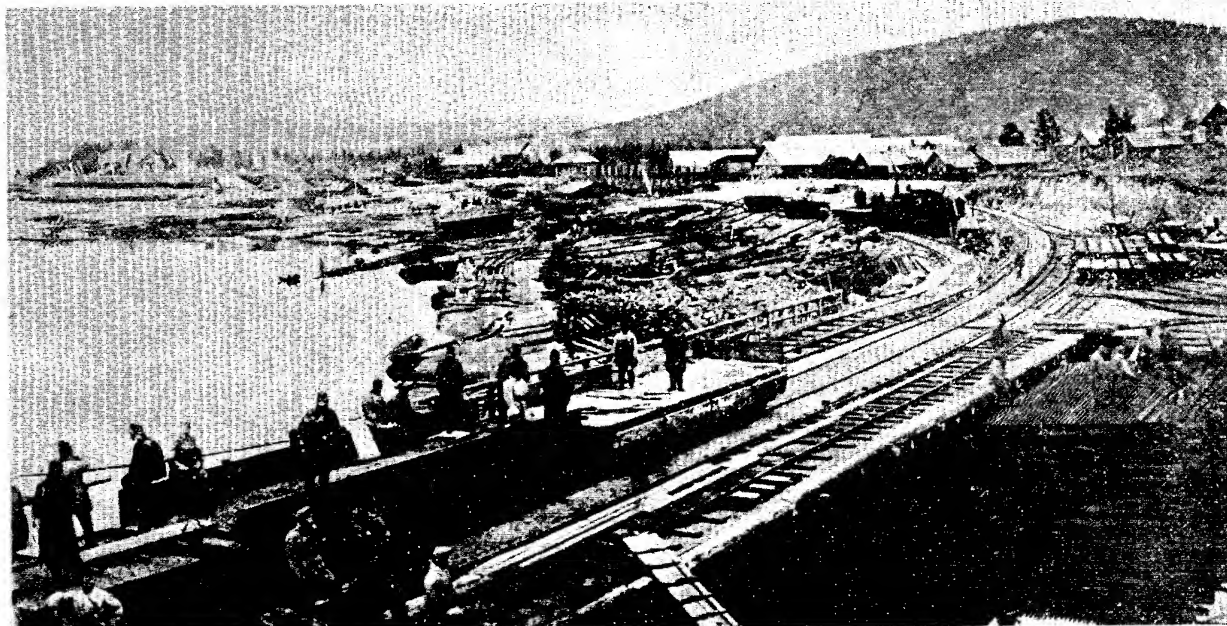


FIGURE VI-32. Kandalaksha.

Looking NE, showing the shore end of lumber pier (Reference No. 2). Marginal wharf under construction at left center of photograph. No date.

(2) Terminal facilities

(a) *Piers and wharves.*—The facilities consist of a pier (FIGURE VI-32) and two marginal wharves, located on the shore of Kandalakshskaya Guba about 0.5 mile north of the mouth of the Niva (FIGURES VI-31 and VI-33). Depths alongside range from 10 to 20 feet. These installations provide about 800 linear feet of berthing space in 15 to 20 feet at mean low water.

Known details of the piers and wharves are shown in TABLE VI-13.

(b) *Mechanical handling facilities.*—Two 7.5-ton cranes with maximum vertical hoists of 20 feet are available at the port. They are believed to be installed on either of the marginal wharves (Reference Nos. 1 and 3, FIGURE VI-33).

(c) *Harbor craft.*—No information available.

(3) Storage facilities

(a) *Warehouses.*—Five buildings, measuring about 120 feet by 40 feet each, are located about 300 yards north of the wharves. These buildings are probably warehouses and are situated on both sides of the railroad serving the port. Their total floor area is about 24,000 square feet.

(b) *Supply dumps.*—There are about three acres of open storage area adjacent to and north of the wharf area.

(4) Capacity and clearance

(a) *Unloading capacity.*—There are no reports on the capacity of the port for receipt and clearance of cargo.

(b) *Facilities for clearing port.*—The port of Kandalaksha is served by a branch line of the Murmansk Railway

TABLE VI - 13
PIERS AND WHARVES
Port of Kandalaksha

DETAILS OF WHARF	REFERENCE NUMBER AND NAME OF WHARF (Port Plan: FIGURE VI - 33)		
	1 Wharf	2 Pier	3 Wharf
Location	W side of Mys Smol'nyy Navolok.	W side of Mys Smol'nyy Navolok.	W side of Mys Smol'nyy Navolok.
Use	General cargo; shipment of ore and lumber.	General cargo; shipment of ore and lumber.	General cargo.
Type and construction	Marginal wharf of open piling with timber deck.	Pier of open piling with timber deck.	Marginal wharf of open piling with timber deck.
Dimensions (feet):		Face N Side S Side	
Length	300 (face).	50 200 130	240 (face).
Depth of water (m. l. w.)	18 to 20.	20 10 to 20 15 to 20	18.
Berthing space available	300.	.. 200 130	240.
Width of apron	Partly open.	Open.	Open wharf.
Transit sheds:	One shed.	None.	None.
Construction	Timber frame and siding.	.....	.....
Length and width (feet)	200 by 60.	.....	.....
Total floor area (sq. ft.)	12,000.	.....	.....
Number of floors	1.	.....	.....
Rail (5'0" gage) and road connections.	Tracks on wharf; truck access to wharf.	Tracks on pier. No truck access.	Tracks on wharf and at rear; truck access to wharf.

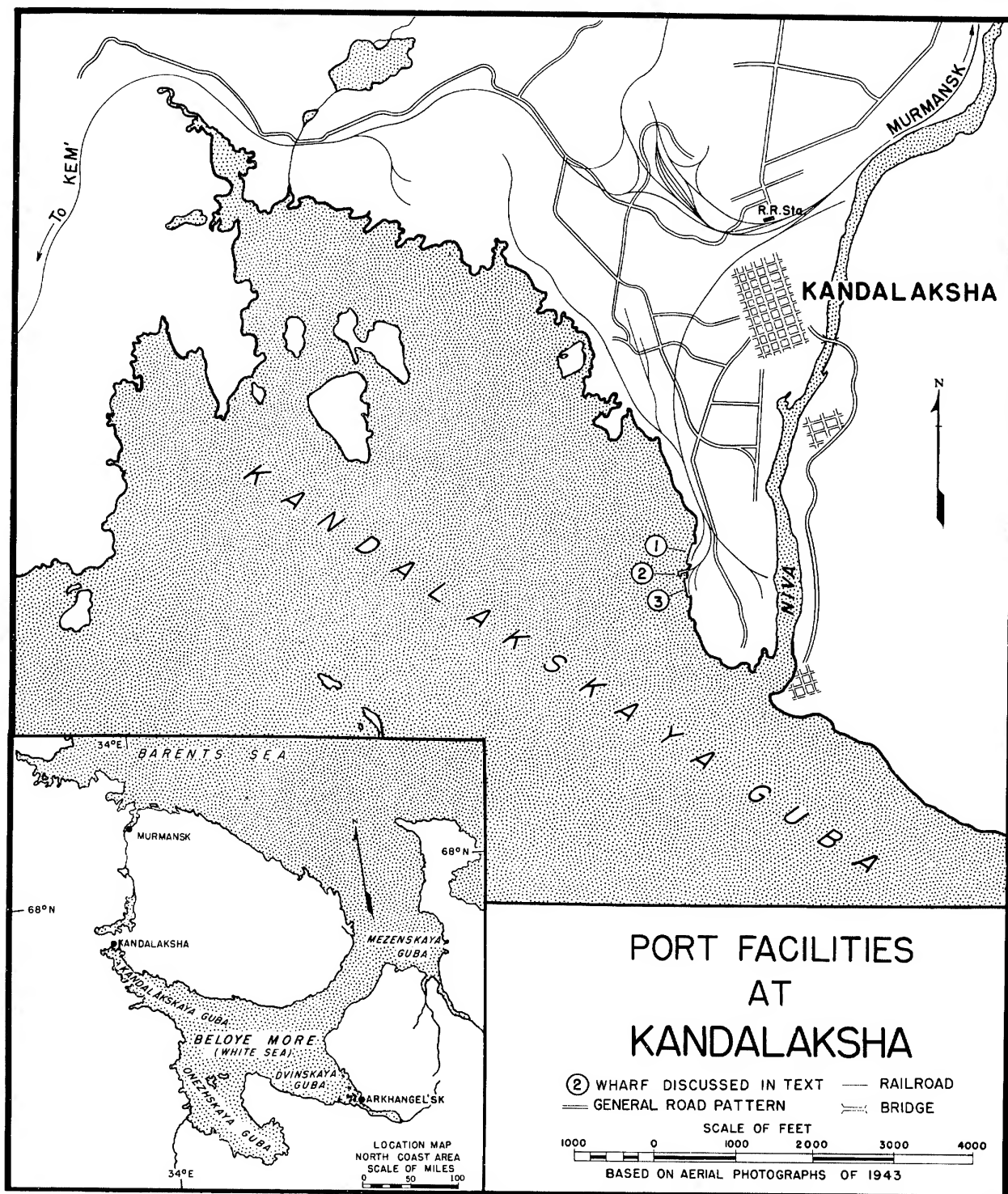


FIGURE VI-33. Kandalaksha.
Plan of port.

(5'0" gage). Between Murmansk and Kandalaksha the line is electrified. The railroad provides connections with Murmansk on the north and Kem' on the south, continuing southward from Kem' to Moscow (Moskva). There are roads to Kem' and Belomorsk alongside the railway line, and to Uleåborg on the Gulf of Bothnia.

(5) Supplies

Extensive hydroelectric development of the Niva has been completed, and transmission lines carrying 220,000 volt, 3-phase, 50-cycle current serve the area. No information on the supply of water or bunkers is available.

(6) *Repair facilities*

The port has no drydocking facilities. A local foundry and welded-metal works, however, does work for the shipyard and repair works at Arkhangel'sk, and should be equipped to handle minor repair work.

(7) *Trade of port*

There are no data available on the trade of the port.

F. Iokan'ga Naval Base (68°04'N, 39°30'E)

Iokan'ga, located on the Barents Sea coast about 100 miles west of the entrance to the White Sea (Beloje More) (FIGURE VI-1), is a naval anchorage and patrol base. The port has no commercial significance and prior to World War II was important only as a small fishing village. At the outset of the war the Soviet Navy established Iokan'ga as an advance base for antisubmarine and minesweeping operations in the White Sea approaches under the jurisdiction of the White Sea forces command. Although limited in port facilities Iokan'ga has commodious, sheltered anchorage for several large vessels.

(1) *Harbor*

Iokan'ga Guba, which forms the harbor, consists of a 4-mile-long water area between the mainland and the westernmost cluster of the Iokangskiye Ostrova (islands), which lie just off and parallel to, the shore (FIGURES VI-34 and VI-35). The harbor ranges in width from about 0.3

mile at the western end to about 1.3 miles at the eastern end. The coasts of the islands facing the harbor are quite regular in contour, with deep water close to shore; the mainland shore, however, is very irregular in configuration and fringed with rocks and shoals which in some instances extend as far as 1,200 feet from shore. General depths throughout the central part of the harbor range from 10 to 18 fathoms.

(a) *Entrance channel.*—Approaches to Iokan'ga Guba are clear and unobstructed and the harbor can be entered without difficulty. The main entrance is east of the port between the islands Ostrov Sal'nyy and Ostrov Medvezhiy. This passage is about 0.5 mile wide between 10-fathom contours with depths of 13 to 20 fathoms in the fairway. A secondary entrance on the northwest between Ostrov Chaiachiy and the mainland is open and clear, but depths in some parts of the fairway do not exceed 20 feet and navigation is dangerous for vessels drawing more than 17 feet.

(b) *Anchorage.*—The principal anchorage is in a mile-long section of the roadstead westward of the lower half of Ostrov Vitte. First- and second-class berths are available in depths ranging from 30 to 60 feet over mud and sand bottom, completely sheltered from sea and swell. Anchorage also may be had southwestward of Ostrov Sal'nyy about 1,800 to 3,000 feet offshore in depths of 50 to 80 feet over sand. This area is subject to swell from northerly winds.

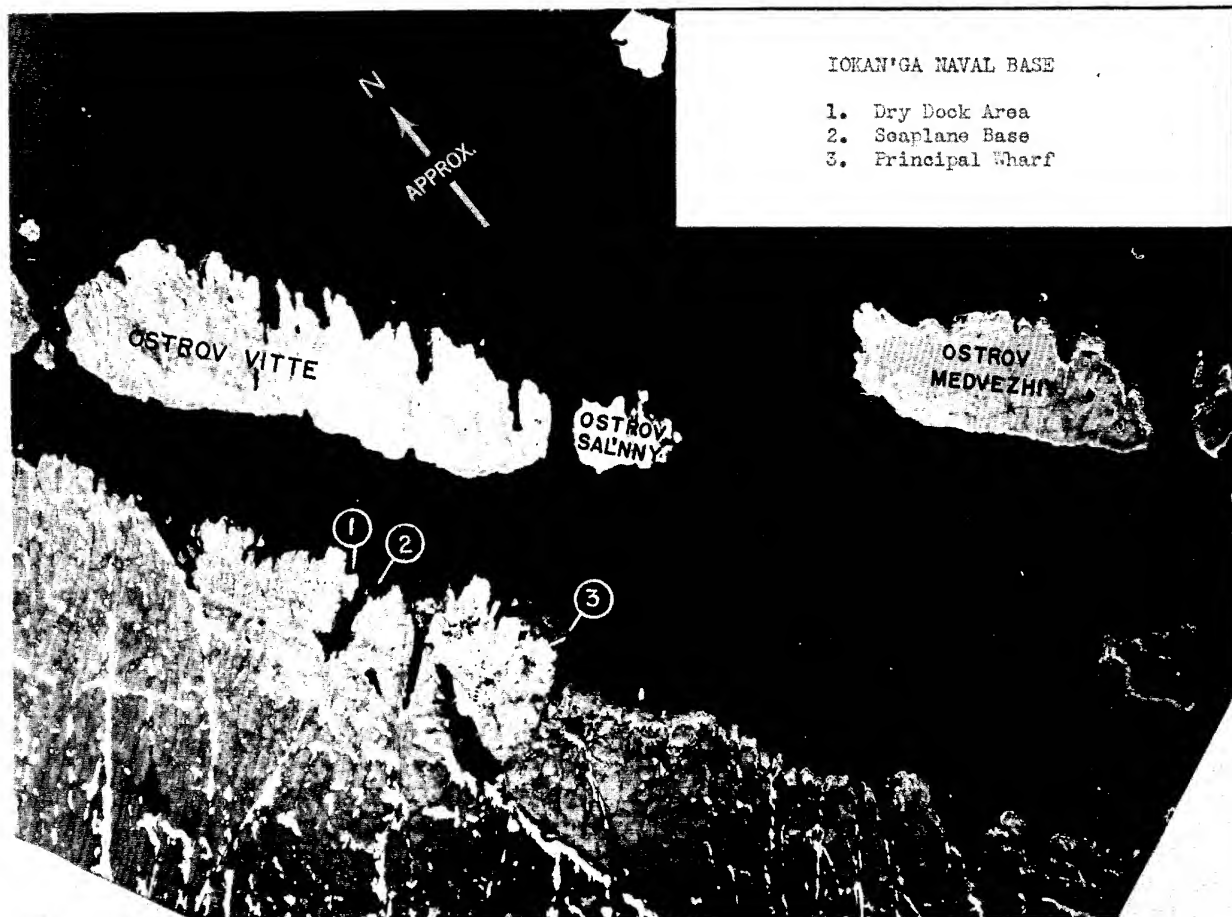


FIGURE VI-34. Iokan'ga.
The port area and vicinity.

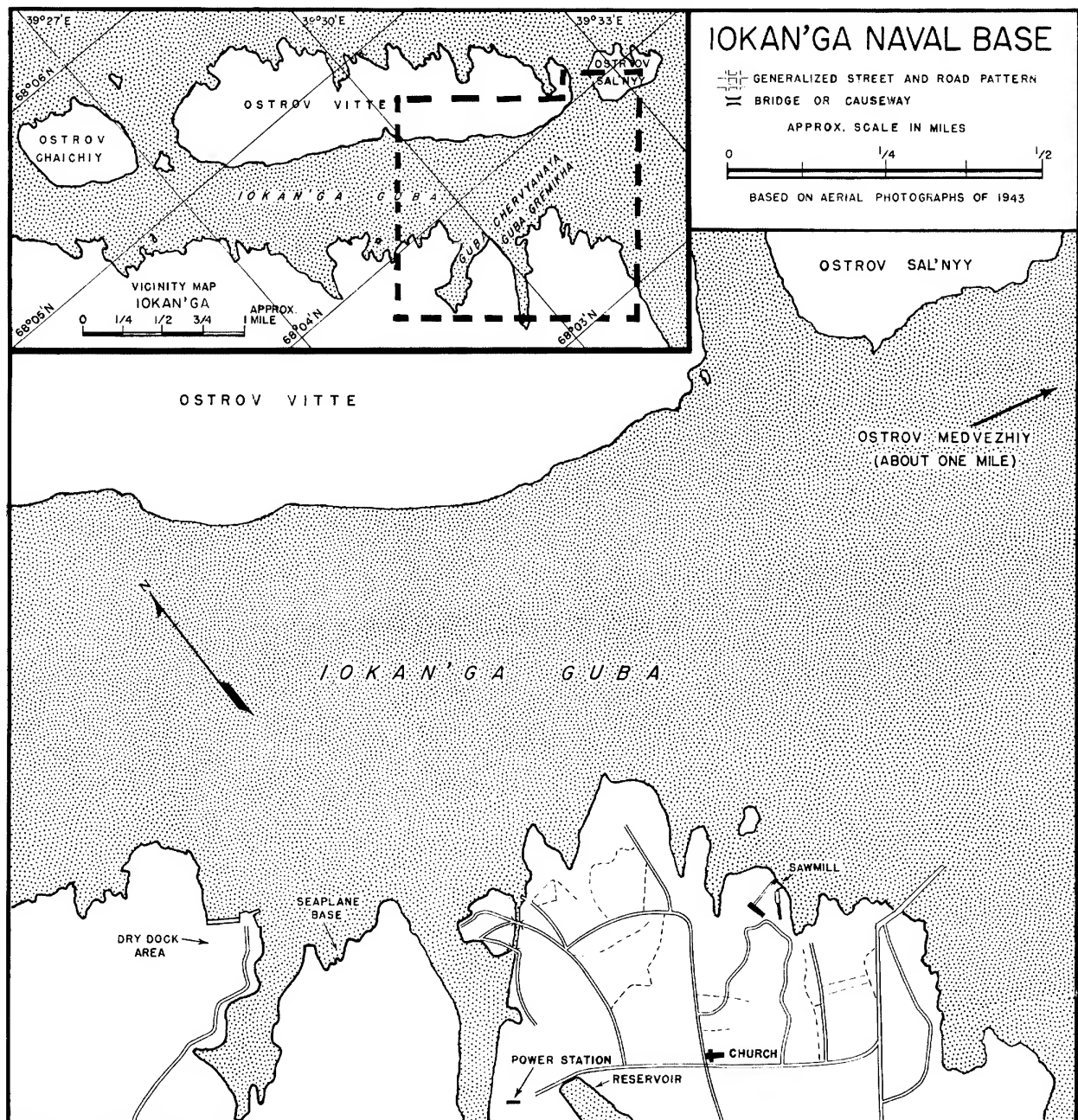


FIGURE VI-35. Iokan'ga.
Plan of port.

(c) *Hydrographic features.*—Tidal data for Iokan'ga are summarized as follows:

Mean high water interval	8 hours 52 minutes
Mean low water interval	15 hours 02 minutes
Spring rise	18¾ feet
Neap rise	15¼ feet
Mean water level	11 feet

A current beginning 3½ hours after the moon's meridian passage flows southeastward through the harbor. In the narrows off Ostrov Vitte the velocity reaches 2½ knots and off Ostrov Medvezhiy, 1 knot. Farther eastward the current is almost imperceptible due to the discharge from the Iokan'ga (river).

(d) *Local weather.*—Southwesterly and westerly winds prevail in winter. Strong northwesterly winds cause a considerable sea in the roadstead. During severe winters, the harbor is covered for short periods with up to 6 inches of ice, but is never closed to navigation.

(2) Berthing facilities

All landing facilities at Iokan'ga were constructed during the war and are exclusively for naval use. The principal installation is a pier of timber construction about 400 feet long and 60 feet wide. Depths alongside in 1944 were reported to be 30 feet at the head of the pier and 15 feet near the root. A report of June 1944 indicates

three other piers at the port, all of timber construction. One was reported to measure 200 by 25 feet, another 150 by 25 feet, and the third was still under construction. These three are not located on the map. Another small pier is on Ostrov Vitte.

(3) Supplies

Fuel-oil tanks of unknown number and capacity were reported installed on the large pier for bunkering naval vessels. The port is reported to maintain stocks of about 5,000 tons of coal.

(4) Repair facilities

In 1943-1944 a dry dock was constructed at the entrance to Guba Chervyanaya in a wedge of filled land between the west shore of the bay and a small off-lying islet. The dock is approximately 500 feet long and 45 feet wide. Small shop buildings are located on the east side of the dock. A small floating workshop capable of handling small repairs was based at Iokan'ga in 1944.

(5) Base activities

Wartime use of Iokan'ga was largely limited to destroyers and minesweepers, although vessels of larger size can enter the harbor. Details of installations ashore are not available, but the layout of the base is indicated on the port plan (FIGURE VI-35). In August 1944 there were an estimated 5,000 naval and military personnel manning the base.

G. Vayenga Naval Base (69°05'N, 33°27'E)

Vayenga Naval Base, located on the east side of the inlet Kol'skiy Zaliv, about 14 miles below Murmansk, is the chief operating base for the Northern Fleet (FIGURE VI-1). It can accommodate capital ships and is the northernmost terminus of a 15-mile single-track extension of the Murmansk - Leningrad Railroad. Extensive expansion of base facilities was in progress in 1943 and has probably continued (FIGURE VI-36).

(1) Harbor

The harbor is an indentation in the eastern coastline of Kol'skiy Zaliv, formed between the points Mys Karbas on the north and Mys Alysh on the south. It is about 1 mile wide at the entrance and indents for about a mile from the entrance to the head of the bay. The margins of the harbor are fringed by drying shoals with a greatest width of about 600 feet. Guba Okol'naya and Guba Alysh are small shoal coves in the northeastern and southern shores. Depths in the harbor range from 18 to 38 fathoms at the entrance to about 3 fathoms near the head.

(a) *Entrance channel.*—The entrance is free and clear with depths of 18 to 38 fathoms.

(b) *Anchorage.*—The best anchorage is in a depth of 18 fathoms, with Mys Karbas bearing 352° and Mys Alysh, 249°. Vessels are sheltered here during northeasterly winds. There are approximately six first-class anchorage berths in Vayenga harbor, of which three are at mooring buoys.

(c) *Hydrographic features.*—Tidal data for Vayenga are summarized as follows:

Mean high water interval	6 hours 40 minutes
Mean low water interval	12 hours 57 minutes
Mean high water spring rise	12 feet
Mean high water neap rise	9¾ feet
Mean water level	7 feet

(d) *Local weather.*—The Kol'skiy Zaliv area is warmed by the Gulf Stream, and its climate is milder than the rest of Arctic USSR. Spring lasts from April to June; sum-

mer conditions prevail in July and August; and winter lasts from early November to the end of March.

The mean annual temperature is 31°F.; mean maximum, 55°F.; and minimum, 11°F. The extreme minimum temperature recorded is about -40°F. The average annual precipitation is 15.8 inches, occurring on 179 days throughout the year. Prevailing winds are south to southwest.

(2) Berthing facilities

Wharf facilities at Vayenga consist of four piers designed exclusively for the berthing of naval vessels and not suitable for efficient general cargo transfer. Details of the facilities are listed below. Each pier is identified on the port plan (FIGURE VI-37) by reference number.

No. 1 PIER

Type	L-head pier of timber and open piling construction; open deck.	
Dimensions (feet):	Length	Depth alongside
Face	Approx. 220	18
NE Side	Approx. 290	12 to 18
SW Side	Approx. 230	12 to 18
Inner side, pierhead	Approx. 175	18
Width of pier	35	
Remarks	Pier projects from a quayed section of reclaimed land. Bulkhead SW of pier root is 340 feet long.	

No. 2 PIER

Type	L-head pier of timber and open piling construction; open deck.	
Dimensions (feet):	Length	Depth alongside
Face	Approx. 80	No data
NE Side	Approx. 140	Do.
SW Side	Approx. 100	Do.
Inner side, pierhead	Approx. 60	Do.
Width of pier	Approx. 20	

No. 3 PIER

Type	Pier of timber and open piling construction; open deck.	
Dimensions (feet):	Length	Depth alongside
NW Side	600	12 to 20
Face	40	20
SE Side	600	12 to 20
Remarks	One traveling crane of unknown type and capacity (reported out of commission in 1944).	

No. 4 PIER

Type	T-head pier of timber and open piling construction; open deck.	
Dimensions	Unknown.	
Remarks	Structure used as fueling berth.	

(3) Base installations

The principal base installations are located in a developed area just south of Gora Alysh (mountain) on the southwest side of Vayenga harbor. At this point are eight or more large brick buildings containing two hospitals with a total bed capacity of about 200, various barracks, administrative headquarters, and naval shops. Several other large brick buildings were under construction on the east side of the harbor in 1944. On Gora Alysh is located a large new radio station. On the hills to the south of the bay are a number of new barracks, sheds, and shops.

(4) Storage and supplies

Several underground storage installations are located near the piers and in the hills around the bay. Petroleum storage tanks of unknown capacity are located to the rear of No. 4 Pier.

(5) Repair facilities

A floating dry dock, known as No. 2 Dock, is located at Vayenga. The dock is 260 feet long, 55 feet wide, and

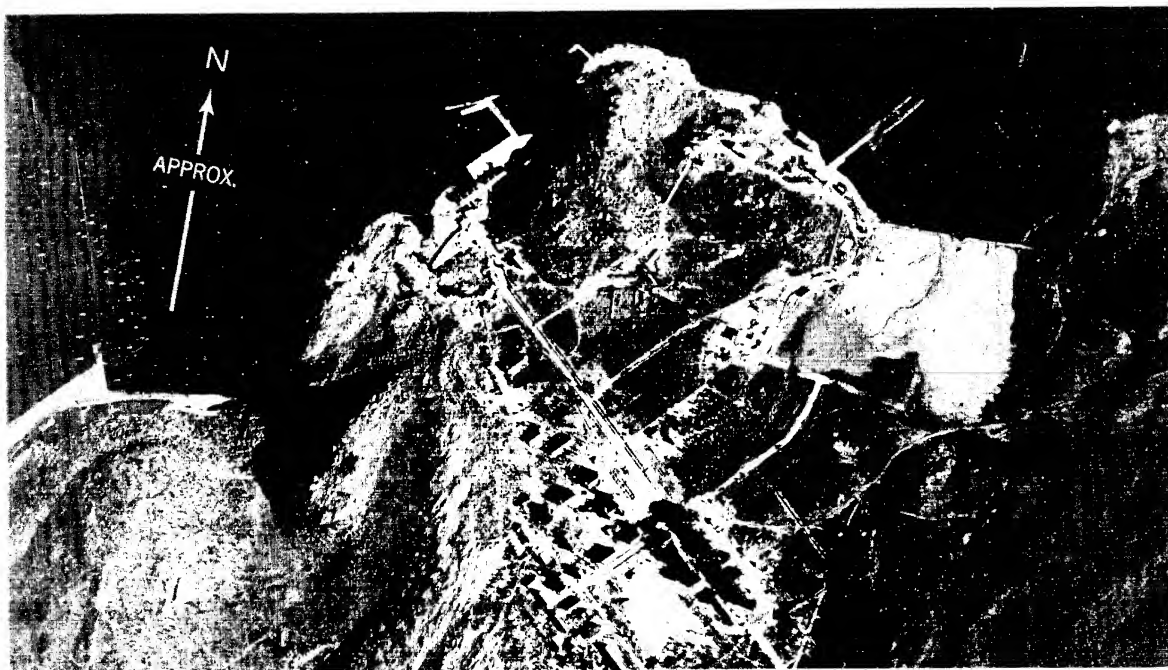


FIGURE VI-36. Vayenga.
Central part of the naval base. 1943.

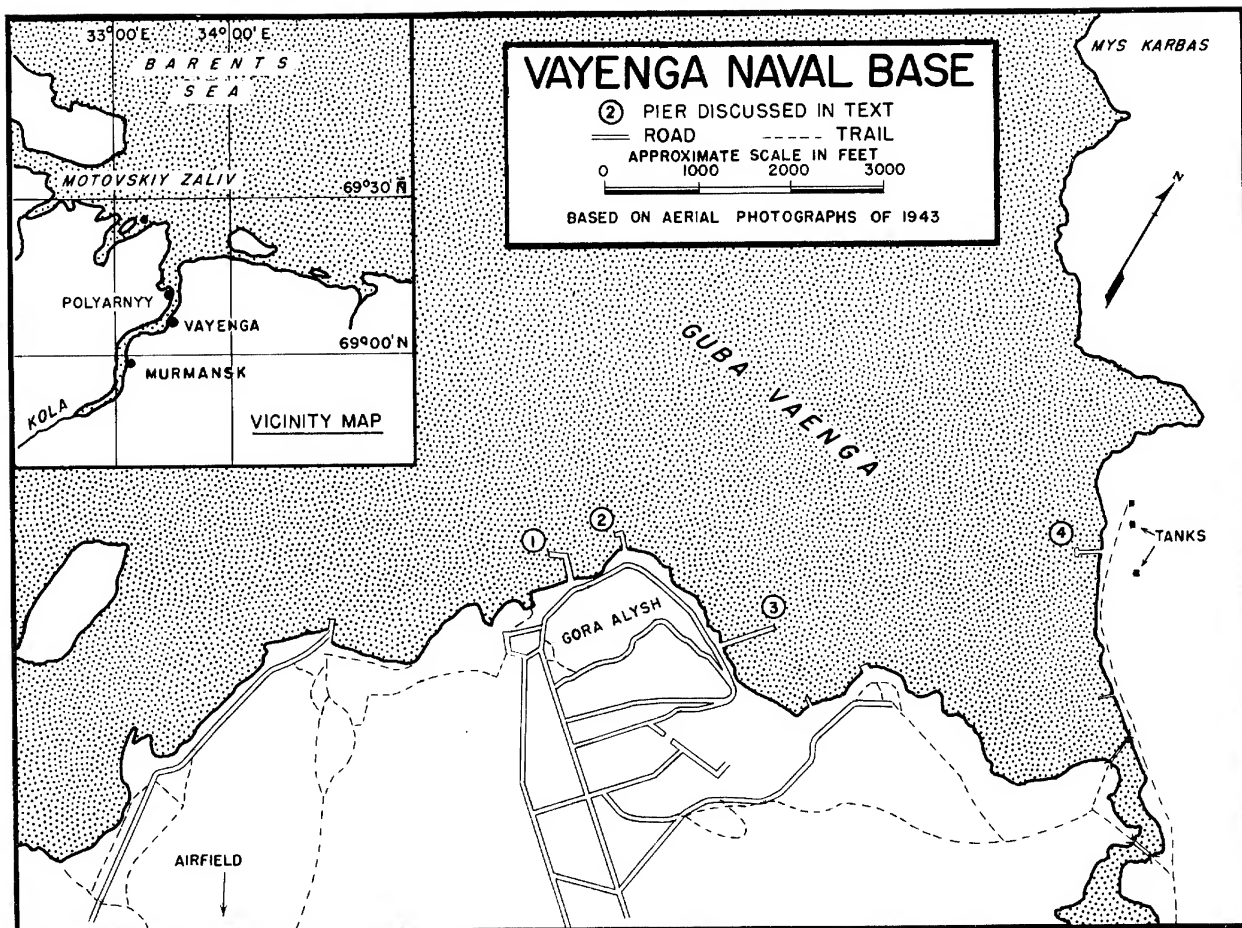


FIGURE VI-37. Vayenga.
Plan of port at the naval base.

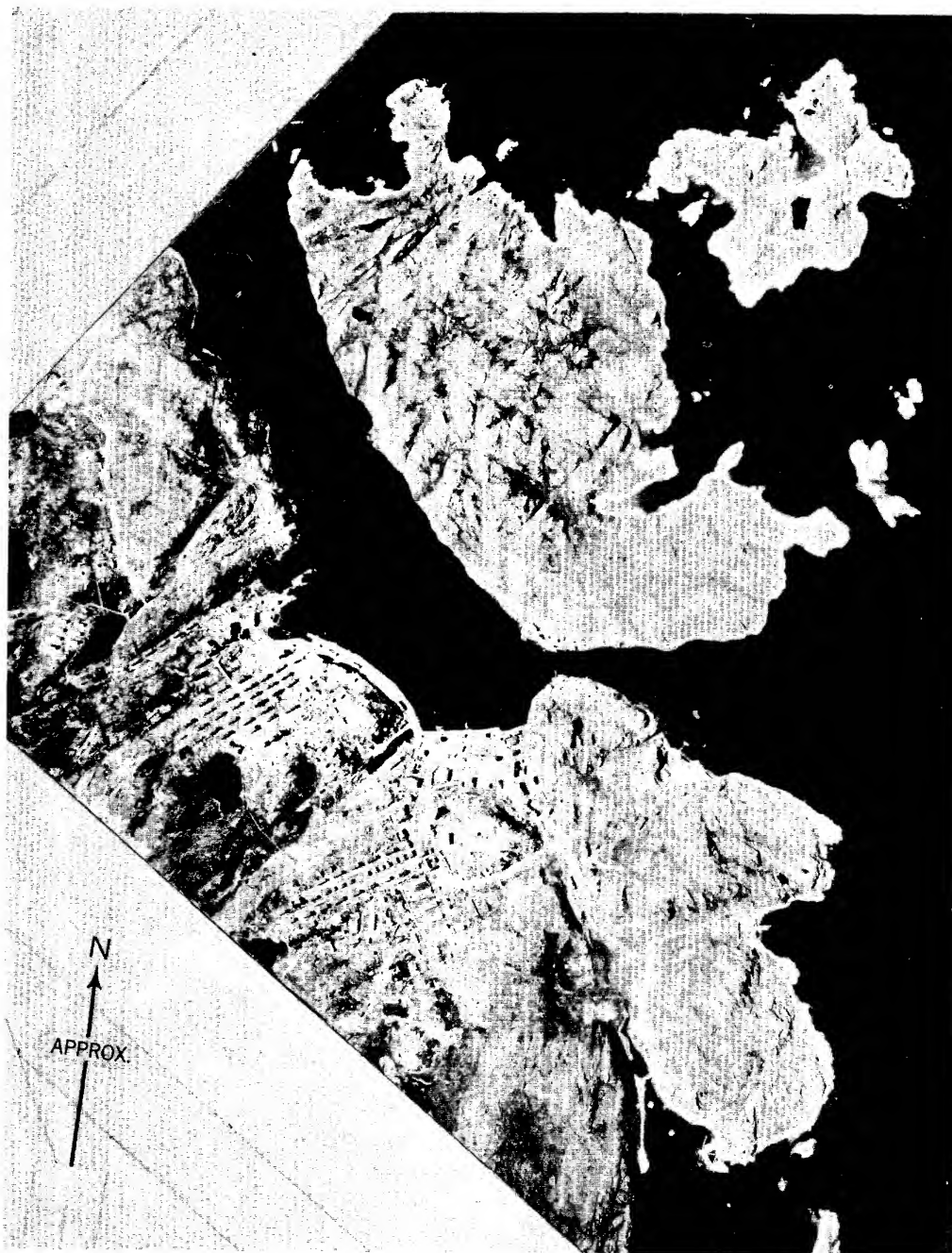


FIGURE VI-38. *Polyarnyy*.
View of the naval base. July 1942.

has a depth over blocks of 16 feet. Its lifting capacity is 1,200 tons. Electric power is furnished from shore at 110 and 220 volts, a.c. Steam at 100 pounds per square inch pressure is available, as well as low pressure air.

H. Polyarnyy Naval Base (69°12'N, 33°28'E)

Polyarnyy Naval Base is located at the head of Yekaterinskaya Gavan', a small bay on the west side of Kol'skiy Zaliv, 25 miles below Murmansk (FIGURE VI-1). It is an operating base for destroyers and submarines and headquarters for the Commander-in-Chief of the Northern Fleet.

(1) Harbor

Yekaterinskaya Gavan', which forms the harbor is a small inlet between Ostrov Yekaterininskiy and the mainland (FIGURES VI-38 and VI-40). The harbor is about 1.5 miles long and 1,000 to 2,000 feet wide, with depths ranging from 6 to 24 fathoms. Excellent shelter is provided by steep hills which rise on all sides.

(a) *Entrance channel*.—The principal entrance is at the north end of the harbor and is about 1,000 feet wide with depths in the fairway of 30 to 40 fathoms. A 400-foot-wide passage which dries at low water connects the

head of the bay with Kol'skiy Zaliv. The northern entrance is unobstructed and can be entered easily by large vessels; the southern entrance is fouled by shoals and usable only by small craft at high water.

(b) *Anchorage*.—Best anchorage is available off the naval base at the southeast end of the harbor in depths of 20 to 24 fathoms. Holding is reported to be poor, and vessels customarily moor ahead and astern; ring bolts are available on the eastern shore, and there are two mooring buoys in the anchorage.

(c) *Hydrographic features*.—Tidal data for Polyarnny are listed as follows:

Mean high water interval	6 hours 40 minutes
Mean low water interval	12 hours 57 minutes
Mean high water spring rise	12 feet
Mean high water neap rise	9¾ feet
Mean water level	7 feet

The flood tide flowing southwestward at the entrance begins 6 hours before high water with a velocity of ¾ knot; inside, it turns southeastward with a rate of ½ knot. There is no appreciable current at the head of the harbor. Ice occurs in February, March, and April but does not impede navigation.

(d) *Local weather*.—During the fall and winter months, violent northwesterly winds sometimes sweep into the harbor. At such times it is dangerous for vessels to lie at the wharves.



FIGURE VI-39. Polyarnny.
Looking eastward. Oct. 1941.

(2) Berthing facilities

The principal landing facilities at Polyarnny are concentrated at the south end of the harbor adjacent to the base and consist of a 2,000-foot-long marginal wharf for destroyers (FIGURE VI-39) and two small piers for submarines. Several minor wharves and landings are located at various points of the harbor and on the margins of Kol'skiy Zaliv eastward of the naval base. Just west of the Main Wharf is a reported covered submarine pen of unknown construction and capacity. Details of the more important wharves at Polyarnny are listed as follows. (All dimensions and soundings shown are approximate only.) Each installation is identified on the port plan (FIGURE VI-40) by reference number.

MAIN WHARF (REF. No. 1)

Use	Destroyer berths.
Type	Quay or marginal wharf of unknown construction fronting a narrow fringe of filled land.
Dimensions	Overall length of face, 2,100 ft.
Depth alongside	30 to 21 ft.
Remarks	Wharf apron is 70 ft. wide and suitable for general cargo transfer. Four sheds on wharf.

WEST SUBMARINE PIER (REF. No. 2)

Use	Submarine berth.
Type	Wooden pier.
Dimensions	300 ft. long; 25 ft. wide.
Depth alongside	20 to 30 ft.
Remarks	Three-ton traveling electric crane serves pier. Diesel oil, water, electric power, and compressed air lines on pier.

EAST SUBMARINE PIER (REF. No. 3)

Use	Submarine berth.
Type	Wooden pier.
Dimensions	170 ft. long; 30 ft. wide.
Depth alongside	20 to 30 ft.
Remarks	Three-ton traveling electric crane serves pier. Diesel oil, water, electric power, and compressed air lines on pier.

MUNITIONS PIER (REF. No. 4)

Use	Transfer of explosives.
Type	Wooden T-head pier.
Dimensions	Overall length, 150 ft.; length of face, 90 ft.; width of head, 35 ft.
Depth alongside	No data.

PIER (REF. No. 5)

Use	General stores transfer.
Type	Wooden pier.
Dimensions	Length, 110 ft.; width, 25 ft.
Depth alongside	No data.
Remarks	Small shed on pier.

KISLAYA WHARF (REF. No. 6)

Use	General stores transfer.
Type	Wooden offshore wharf; two shore connections.
Dimensions	Length of face, 310 ft.; width of wharf, 85 ft.
Depth alongside	No data.

(3) Base installations

Most of the base installations are located at the south end of the harbor and are housed in buildings of brick, frame, or log construction. Facilities include several groups of barracks and quarters, workshops, power plant, fleet radio station, storehouses, and munitions dumps.

(4) Storage and supplies

There are numerous general warehouses, both on the principal wharves and on the upland adjacent. Several underground storage installations for munitions and fuel are located in the vicinity of the base. A report of 1945 indicated that a stock of about 1,500 tons of diesel oil was maintained. Bunkering of submarines was effected by two hose connections at the submarine piers at the rate of 10 tons per hour. Water is available from hydrants at the wharves but requires boiling and filtering. Electricity is supplied to the base, and is available at the wharves at 220 volts, a.c. and d.c. Compressed air is supplied to the submarine berths at pressures up to 3,000 pounds. Distilled water is available in 6-gallon rubber jars.

(5) Repair facilities

No drydocking facilities are available at Polyarnny; however, the base is prepared to handle extensive machinery and above-water hull repairs. Installations ashore

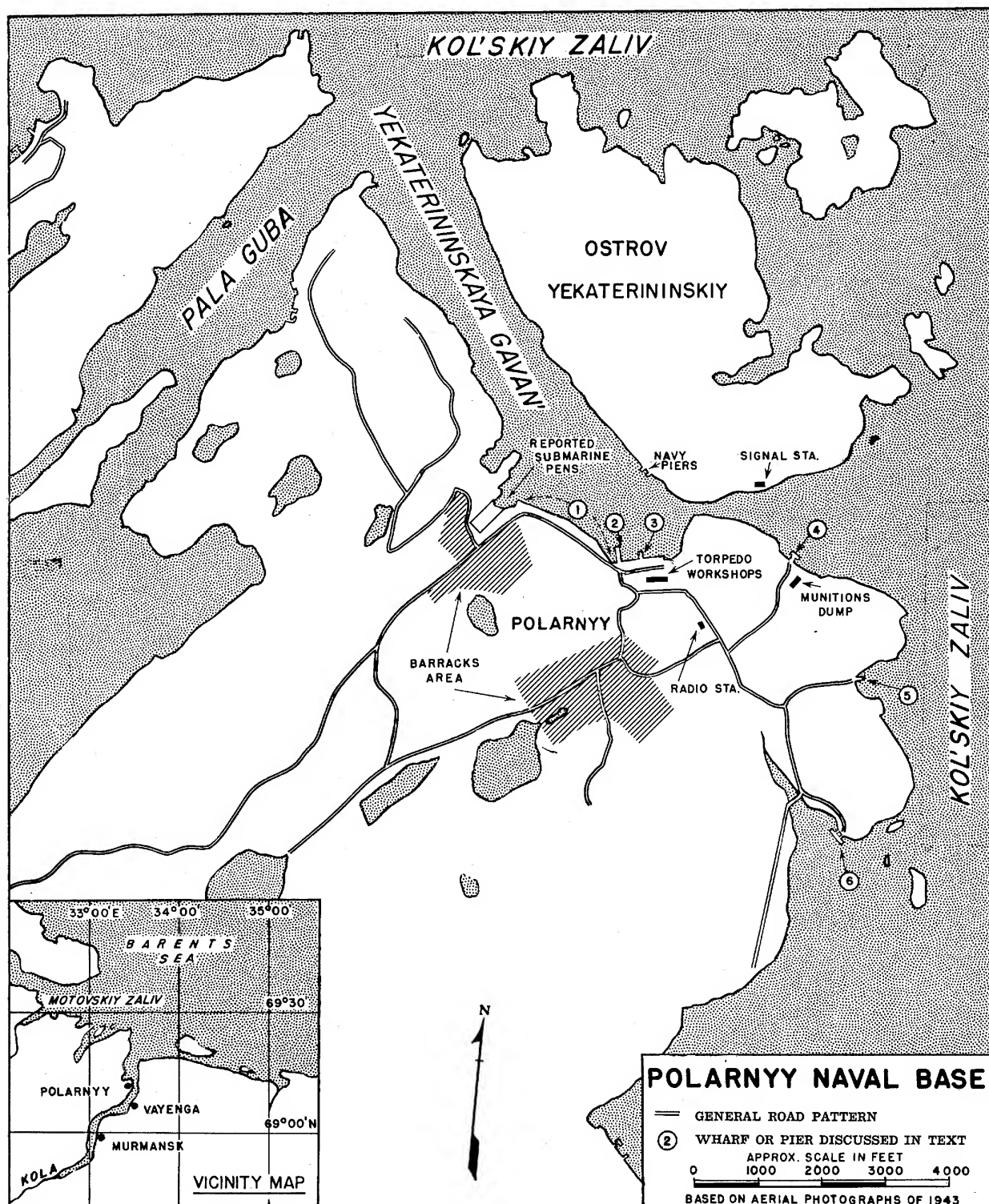


FIGURE VI-40. Polarnyy.
Plan of the naval base.

include a torpedo shop, a small machine shop (uncompleted in 1945), and a periscope repair shop. A steel hulk converted into a floating repair plant is based at Polyarnyy and contains several light machine tools. The repair ship "Krasni Gorn" (1,982 tons) was moored in Guba Pala just west of Polyarnyy harbor in 1945. The vessel had a well-equipped machine shop, a foundry handling brass and iron castings up to 100 pounds, a boiler shop, and a small electrical shop. Portable electric and oxyacetylene welding sets are available on the wharves.

63. PRINCIPAL PORTS, WEST COAST

A. Leningrad (59°56'N, 30°18'E)

Leningrad is situated on the bay Nevskaya Guba at the mouth of the river Neva, which connects Ladozhskoye Ozero (Lake Ladoga) with the eastern part of the Gulf of Finland (FIGURE VI-41). A large metropolis, with a wide range of light and heavy industries, it had a population in 1939 of about 3,200,000. It is the largest of all the northern Soviet ports, comprising a seaport on the edge of the Neva delta, and an extensive river port linked with the inland waterway system. The port is closed by ice for about 15 weeks each winter (FIGURE VI-42). Lumber, pulpwood, and grain exports are the bulk of the port commerce. The wharves for oceangoing vessels total 29,560 linear feet, in depths of 18 to 30 feet (Port Facilities Map, FIGURE VI-54).

A program for the development of the river port upstream from Lieutenant Schmidt Bridge (Most Leytenanta Shmidta), was begun in 1939 and interrupted by the war. It was proposed to make this the largest river port in the world. There were projected for completion in 1942 a large maritime passenger station, 7 miles of rail-served wharves and quays, mechanical handling facilities, warehouses and transit sheds. Other than that there are numerous granite quays, little information is available on the present status of the river port of Leningrad.

(1) Harbor

The Neva delta on which the city of Leningrad is centered is crossed by two main distributaries, the Bol'shaya Neva and the Malaya Neva, as well as by several minor natural and artificial channels. A number of bridges connect the various insular segments of the delta. Lieutenant Schmidt Bridge, the lowermost of seven which cross the Bol'shaya Neva in its passage through the city, is the upper limit of navigation for vessels drawing over 15 feet. This steel arch deck bridge has a double bascule span, 40 meters (about 131 feet) long. Vessels of less draft can proceed up the Neva to Ladozhskoye Ozero through the bridges, which have 69-foot-long draw spans. The deep-water port of Leningrad occupies the Bol'shaya Neva, and the remainder of the delta faces southward. Upper Harbor comprises the mouth of the Bol'shaya Neva below the Schmidt bridge; and Lower Harbor consists of a group of interconnecting dredged basins. A lateral artificial channel, an inner extension of the Ship Channel (Morskoy Kanal), connects the two harbor sections.

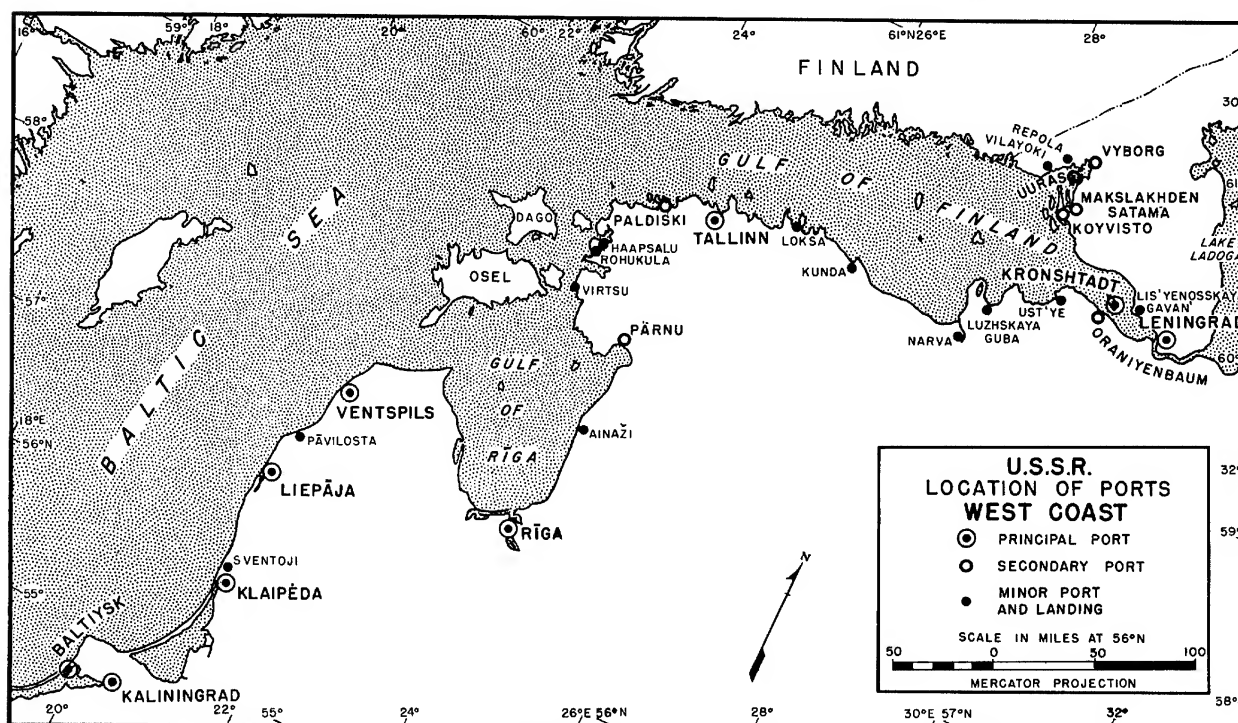


FIGURE VI-41. Location of ports on the west coast of European USSR.